ICCB 2017

CARTAGENA, COLOMBIA • JULY 23-27, 2017

Insights for sustaining life on Earth

ABSTRACT BOOK

28TH INTERNATIONAL CONGRESS FOR CONSERVATION BIOLOGY (ICCB)

Society for Conservation Biology

28TH INTERNATIONAL CONGRESS FOR CONSERVATION BIOLOGY

ICCB 2017 brought together knowledge from the natural and social sciences that can transform our work and relationship with the urban and natural world, allowing us to move toward a more sustainable future. There were 1,268 accepted abstracts, including 234 posters, 40 lunchtime workshops, 60 symposia, 56 knowledge cafes, 139 four-minute presentations and 373 twelve-minute presentations, as well as 1,480 participants from 71 countries. The plenaries, talks and discussions challenged how we think about conservation, highlighting the importance of understanding impact, working strategically for a variety of conservation actions and inspiring others. We have no doubt that ICCB 2017 will be remembered in the Society for Conservation Biology as the most diverse, inclusive and interdisciplinary conference to date. We hope all that attended will keep this spirit alive.

We are honored to have chaired the Scientific Committee and incredibly grateful to the members of all the committees and volunteers who contributed their time and energy to making this conference a success.

Morena Mills, Kartik Shanker, and Ximena Rueda Fajardo

Society for Conservation Biology

ABOUT THE SOCIETY FOR CONSERVATION BIOLOGY (SCB)

SCB is a global community of conservation professionals with members working in more than 100 countries who are dedicated to advancing the science and practice of conserving Earth's biological diversity. The Society's membership comprises a wide range of people interested in the conservation and study of biological diversity: resource managers, educators, government and private conservation workers, and students. SCB publishes the flagship peer-reviewed journal of the field, Conservation Biology, and the cutting-edge online journal, Conservation Letters. The Society provides many benefits to its community, including local, regional, and global networking, an active conservation-policy program, and free online access to publications for members in developing countries. SCB also administers a postdoctoral program, the David H. Smith Conservation Research Fellowship Program, sponsored by the Cedar Tree Foundation.

HOW TO CITE THE ICCB 2017 ABSTRACT BOOK

TO CITE THE ABSTRACT BOOK

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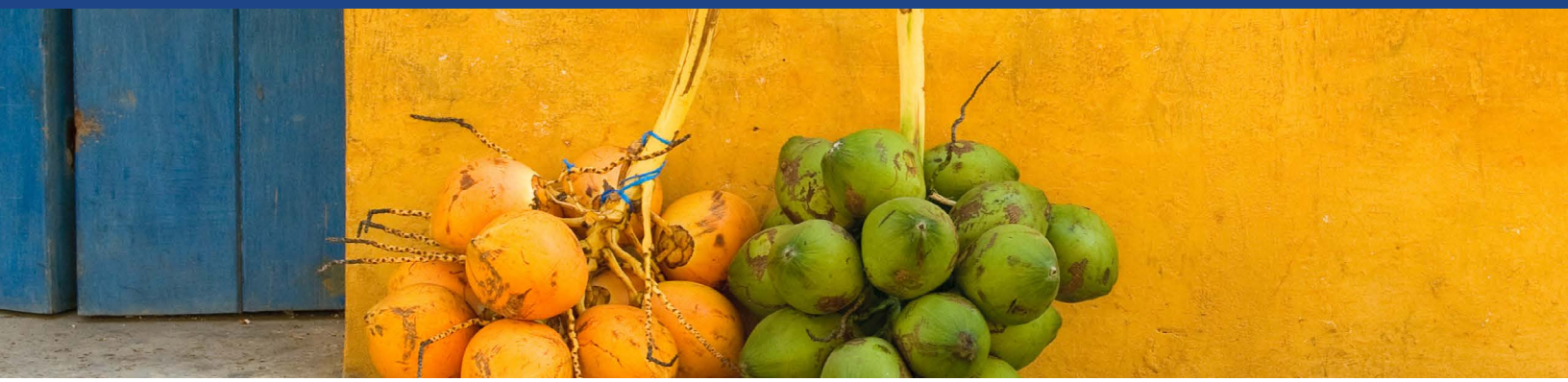
*Please note that **ICCB 2017 abstracts are organized by type and ordered by alphabetical order by title. For each abstract, the first author listed is the presenting author followed by the other authors in alphabetical order by surname.***

*For any queries on regards to this book of abstracts, please contact SCB Executive Officer at **iccbinfo@conbio.org***



GREENING COLOMBIA'S PEACE PROCESS: A WAY OF THINKING ABOUT ENVIRONMENTAL PROBLEMS

Brigitte Luis Baptiste, Instituto de Investigación de Recursos Biológicos Alexander von Humboldt

Brigitte examines new ways of thinking about conservation and environmentalism in the context of the ongoing peace process in Colombia.

IS RESTORATION THE NEW CONSERVATION? PARADIGMS, PRACTICE, AND PEOPLE

Robin Chazdon, Department of Ecology & Evolutionary Biology at the University of Connecticut

Restoration and conservation are often viewed as contrasting approaches with distinct values, objectives, professional societies, conferences, and journals. But both approaches are required to protect and manage ecosystems and their unique biodiversity, and to ensure a flow of nature's contributions to people. Robin will discuss how important paradigms and practices can transform a conservation focus to a restoration focus.

PERVERSE CONSERVATION OUTCOMES OF REWARDS-BASED INTERVENTIONS

Arun Agrawal, School of Natural Resources & Environment at the University of Michigan

Rewards-based approaches to conservation and environmental sustainability have gained ground over the past two decades. Advocates of these approaches highlight how compensation – conditional and unconditional – can strengthen environmental initiatives, and can make up for the deficiencies of control and regulation based approaches or of approaches that seek to improve environmental awareness to persuade citizens to take environmentally appropriate actions. Using timeseries panel data from India, Arun's talk will examine the effectiveness of rewards based approaches to enhance environmental motivations, actions, and outcomes.

RETHINKING CONSERVATION IN AN UNCERTAIN WORLD

E.J. Milner-Gulland, Tasso Leventis Professor of Biodiversity, Department of Zoology, University of Oxford; Interdisciplinary Centre for Conservation Science

In order to conserve effectively, we need to understand the dynamic and multi-scale social-ecological systems we are working in, design effective interventions, monitor and evaluate their outcomes and learn from our experiences. This is well understood in theory, but in practice a major rebalancing is needed towards the design, evaluation and learning components of this approach. This requires a more predictive approach to conservation and a more nuanced understanding of what "evidence" actually is, and for whom we are generating it. We need to be bold and innovative in our use of models as well as tools from other disciplines, and think at both the individual and system scales. We also need to stop ignoring or sidestepping uncertainties, but embrace them so that we can design robust interventions. E.J. will illustrate these points through reflecting on her own mistakes, misconceptions, might-have-beens and insights, over 25 years of studying natural resource use, from hunters through to consumers, local and international, legal and illegal.

FORUM DISCUSSIONS

INSIGHTS FROM CONSERVATION ENTREPRENEURS

Moderator: Morena Mills, Imperial College of London

Panelists: Alex Deghan, Conservation X Labs; Jen Chapman, Blue Ventures; Chris Wood, Cornell Lab of Ornithology

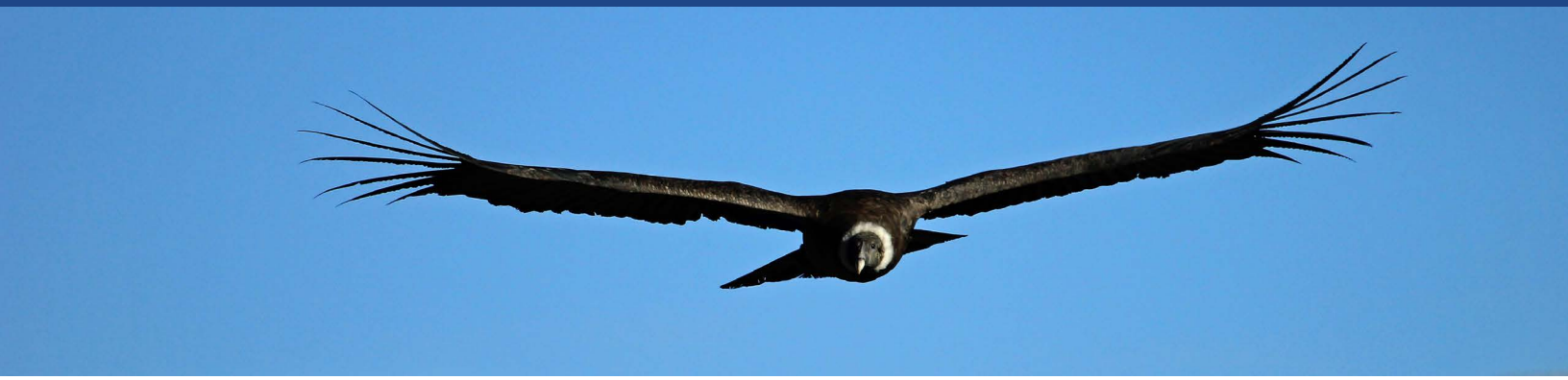
You might think that protecting species competing for resources with over seven billion people is an insurmountable task, yet for some people opportunities are everywhere. These people can advance conservation projects in a world of political instability, rapidly changing technology and human desires. The panel celebrates these conservation entrepreneurs who manage to identify and exploit opportunities for biodiversity science and conservation that few people saw coming, and in doing so are helping to drive large biodiversity gains.

POST-CONFLICT AND CONSERVATION IN COLOMBIA: CHALLENGES AND OPPORTUNITIES

Moderator: Ximena Rueda, Universidad de los Andes

Panelists: Ati Quigua, indigenous leader (Arhuaca), Colombian pacifist and environmentalist; Dalia Mina Valencia, Afro-Colombian leader, Consejo Comunitario de la Cuenca del Río Yurumanguí; Danilo Villafañe Torres is a leader with the Arhuaco Indigenous Peoples of Colombia, President of the Confederación Indígena Tayrona, and advisor to the Colombian Ministry of Environment and Sustainable Development; Daniel Garcés Aragón – Afro-Colombian leader, Administrator of Agribusiness Companies of the Popayán University Foundation, lawyer of the La Gran Colombia University, Master in Human Rights, Interculturality and Development of the Pablo de Olavide University, and candidate to Doctor in Legal and Political Sciences of the same university; and a representative of the Environmental Sustainable Development at National Department of Planning

After battling for 50 years, the Colombian government and the Revolutionary Armed Forces of Colombia (FARC) signed a peace agreement in late 2016. This agreement brings about opportunities for rural economic development and land restitution for those who had lost their land as a result of conflict. Details of these decisions can have large implications for biodiversity conservation as Colombia is one of the most biologically rich countries on earth. This discussion will bring together scientists, indigenous leaders and government officials who will focus on the challenges and opportunities for conservation in Colombia's post conflict era.



A BIOECONOMIC MODEL OF SUSTAINABLE WHALE-WATCHING FOR THE PHILIPPINES

Allison Santos, Nova Southeastern University

We report here the first bioeconomic model designed to optimize whale-watching effort for sustaining a spinner dolphin (*Stenella longirostris*) population in the Philippines. The model is based on the maximum sustainable yield (MSY) concept. Whale-watching can negatively impact the behavior, habitat use and life history of cetaceans. To sustain a population under whale-watching activity, operators still need to make a profit. We investigated the bioeconomics of unrestricted whale-watching in one of the more popular whale-watching cities of the Philippines. We evaluated annual cost and revenue of registered operators and modelled a population of spinner dolphin under different levels of whale-watching effort. For the years 1995–2013, 12 of the 16 vessels lost an average of $4,000/yr. Fixed costs (e.g., wages and permits) were the largest expenditures for operators, followed by capital charges (e.g., boats and radios) and operating outlays (e.g., fuel and other business opportunities). Sensitivity analysis showed that operators lost money even when depreciation rate was set as low as 1 %. Under current effort (n = 16 vessels), the dolphin population is predicted to decrease by 94 % in 25 years. Under this high level of effort, more cetaceans are exposed to vessels and fail to reproduce. Our model showed that since operations began in 1995, the abundance of spinner dolphin fell below the MSY as effort increased. We recommend a fixed number of permits and trips per vessel, in which all operators cooperate to limit the number of vessels out on the ocean. Even with as few as 4 vessels, the population still declines. However, if effort is reduced to 3 vessels/day, our model predicts that the dolphin population will increase by 75 % in 27 years. Overall, our results indicate that the spinner dolphin population is overexploited by current whale-watching and can be expected to decline.

A CLIMATE ACTION PLAN FOR BIRDS IN LATIN AMERICA AND THE CARIBBEAN

Chad Wilsey, National Audubon Society; John Beavers, National Audubon Society; John Myers, National Audubon Society; Stuart Butchart, Birdlife International; Luis Fernando Castillo, Asociacion Calidris; Matthew Jeffery, National Audubon SocietyGary Langham, National Audubon Society; Oscar Maldonado, Private Consultant; Edward Perry, BirdLife International; David Wege, BirdLife International

Climate change is an observable, global threat to birds. The Climate Action Plan for the Americas provides a roadmap to a sustainable and resilient future for birds in Latin America and the Caribbean. The result of a year-long collaborative process of BirdLife International, the National Audubon Society, and 12 country partners, it is the first comprehensive regional plan addressing birds, habitats and climate change. Its strength comes from the contribution of partners with expertise and experience in avian science and conservation as well as in-depth understanding of the region's socio-economic, political, and environmental context. The planning process was organized around the Open Standards for the Practice of Conservation and the plan is focused directly on implementing actions to achieve measurable outcomes. It also incorporated outputs from a region-wide analysis of climate change impacts on over 3000 species of birds that highlighted species of concern and places of projected stability and change for conservation action. The plan consists of four Ecosystem-based Strategies to help drive tangible progress on mitigation by mobilizing partners and other stakeholders on behalf of national, regional, and global policies that reduce carbon emissions and promote clean energy. They will also advance science-based adaption solutions that prepare habitats and bird populations to withstand the impacts of climate change, including sea level rise, drought, and changing weather patterns. Also included in this plan are Enabling/Capacity Strategies. These are an essential element of this plan, as only by increasing partner capacity and integration throughout

the region can we achieve our goals. Further, each of our partners has developed a country-specific Climate Action Plan to promote engagement by government leaders and agencies, civil society and other national stakeholders.

A COMPARISON OF FOUR METHODS TO DETERMINE THE LOCATION OF HIGHWAY-CROSSING SITES FOR TWO CARNIVORES

Christine Proctor, Harrisburg University; Marcella Kelly, Dept. of Fisheries and Wildlife; Andrew Trent, Virginia Tech; Michael Vaughan, Virginia Tech

With more than 20% of US land impacted by highways, road-related effects on wildlife are a growing concern. In response, many local, state, and federal agencies are incorporating mitigating structures into highway design in order to reduce the occurrence of wildlife-vehicle collisions. However, high variability in use of wildlife crossing structures indicates that consideration of placement, construction specifications, and distance between crossings are essential factors influencing success of crossing structures (Paquet and Callaghan 1996). Past research also has shown that habitat connectivity plays a large role in successful use of crossing structures for carnivores (Kindall and van Manen 2007). We compared four methods for identifying highway-crossing locations of red wolves and black bears along a 44 km stretch of a highway in North Carolina, USA: camera-traps, raw movement paths generated from GPS collar locations, Brownian bridge movement models, and by hair-traps along the length of the highway. We captured and GPS collared 30 red wolves and 28 black bears. We found that camera-trap data, hair-trap data, and Brownian bridge movement models were in agreement as to the location of red wolf and black bear highway-crossing sites. However, crossing sites identified using raw movements paths were shifted by 0.8 km to 1.6 km. Brownian bridge models indicated that the presence of a canal crossing structure was the best predictor of where a red wolf will cross. Though black bears crossed the road ubiquitously, the density of crossings was higher in the vicinity of a food source. Our results stress the importance of using the correct methodology in determining the location of wildlife crossing sites in order to increase the success of mitigation efforts. These results can be used to guide the placement of mitigating structures during highway widening and identify what land uses will increase the success of road crossing structures.

A HOLISTIC APPROACH TO EFFECTIVE MANAGEMENT OF PROTECTED AREAS USING SMART TECHNOLOGY IN SOUTHERN BELIZE

Karla Hernandez Aguilar, Ya'axché Conservation Trust; Marchilio Ack, Ya'axché Conservation Trust; Benjamin Fletcher, Ya'aaxché Conservation Trust; Said Gutierrez, Yaaxche Conservation Trust

The protected areas system throughout Belize faces numerous threats such as habitat fragmentation, illegal extraction of natural resources, absence of strategic planning and effective operations and a lack of cohesion and communication between managing organizations and buffering communities. These threats can create major issues and deficiencies in the effectiveness and efficiency of the management of the system on a national level. In order to address this, and as part of our efforts to contribute to improved conservation of the national protected areas system of Belize, Ya'axché Conservation Trust (YCT) adopted the Spatial Monitoring and Reporting Tool (SMART) in 3 protected areas to collect information on illegal activities and has been working together between government, managing organizations and buffering communities to strengthen enforcement efforts. In 2015, YCT piloted the use of SMART for 6 months, guided by support from the Wildlife Conservation Society (WCS) and eventually in 2016 fully adopted the use of this tool to collect data on illegal activities and planning of patrol routes for better management decisions. The successful pilot of this tool, not only placed YCT as a leader in the implementation of SMART in terrestrial protected areas from Belize, but sparked the interest of other organizations, and led to a series of workshops with the Belize Forest Department and several other co-managers of protected areas. Results from our reports on SMART show that since 2015 we have increased 55 % our number of patrols and the distance covered, up to 45% as well as reducing significantly our number of incidents. These results have contributed significantly to a better management of our protected areas by increasing our number of patrol routes and increasing our patrols together with other partner enforcement agencies, to cover a larger area for enforcement efforts, thereby contributing to a holistic landscape management approach.

A LANDSCAPE APPROACH TO CONSERVATION: FROM THEORY TO BOOTS-ON-THE-GROUND IN INDONESIA

Daniel Collette, Zoological Society of London; Angela Yang, ZSL

Despite the global significance of Indonesia's biodiversity, it is under unprecedented threat: Indonesia suffers from the highest rate of deforestation in the world, a direct result of conversion to agro- and extractive industries such palm oil, timber, pulp and paper, and mining. On the island of Sumatra, South Sumatra Province is home not only to important ecosystems for Critically Endangered species such as the Sumatran tiger, but to peatlands that are vital for climate change regulation as well as environmental health. However, the increasing pressures from expanding human populations, illegal logging and unsustainable business practices are threatening this fragile landscape. The Zoological Society of London (ZSL) and our partners have developed a "landscape approach" project based on a public-private-people partnership that supports the Governor of South Sumatra's vision of Green Growth for the province. The "Landscape Approach" concept--one that emphasizes adaptive management and stakeholder involvement to achieve multiple objectives--has been circulating in conservation spheres for years, but not until recently has this been applied to the sustainable management of conservation projects. During this session, ZSL will showcase our KELOLA Sendang project that aims to protect and restore connectivity for Sumatran tigers and biodiversity in a 1.6 million ha multi-use landscape, while simultaneously achieving inclusive growth, community prosperity, forest protection, and the ending of deforestation, peatland drainage and wildfires. We will discuss the challenges--and important lessons learned--from our first year-and-a-half of this project, beginning with the arduous Inception Phase through mid-Implementation, as well as future plans through 2018. While the landscape approach is not the panacea to conservation, it does present a way forward for conservation science to help create a sustainable future for both biodiversity and people.

A PATH FORWARD: ENABLING DECISION SUPPORT AMONG CONSERVATION PRACTITIONERS AND STAKEHOLDERS

Gladwin Joseph, Conservation Biology Institute

Conservation planning and assessments have seen huge strides in the past few years as computing power, algorithms, and prioritization are becoming more advanced. These advances within conservation have been appreciated but do leave some feeling like black-box algorithms are driving the process, and with more and more information available it becomes harder to find that information, compare it to other data, and transparently show how it all came together. The Conservation Biology Institute has developed an open- access system that links simple spatial analysis with modelling to address these issues allowing for more public and stakeholder engagement in conservation planning. Data Basin is the mapping and analysis platform that supports learning, research, and sustainable environmental stewardship. It allows for interactive mapping and analysis through web based browsers, bringing many of the capabilities of a GIS platform to any user. Currently it has over 17,000 users and hosts over 20,000 datasets. In its use as a platform for conservation and resource planning it has shown how open and easy access to spatial information can garner support through stakeholder engagement and review. The Environmental Evaluation Modelling System (EEMS) was developed to allow for decision support models to be displayed within Data Basin. EEMS is a platform-independent modeling system that can be used to evaluate landscapes for natural resource planning and has been successfully leveraged for many conservation planning projects. The accessibility of Data Basin and the transparency of EEMS have led to conservation, mitigation, and renewable energy planning in California using stakeholders to drive many of these processes, and as a result the processes have had large support across the conservation community. We will show how this very accessible system has guided conservation planning in California with a few examples.

ACOUSTIC MONITORING IN THE TROPICAL FOREST: CASE STUDIES IN FRENCH GUIANA

Juan Ulloa, Muséum national d'Histoire naturelle - Université Paris-Saclay; Thierry Aubin, Université Paris-Saclay; Jérôme Sueur, Muséum national d'Histoire naturelle

Monitoring animal species is key to management plans of natural habitats and ecosystems. The task is particularly decisive and challenging in tropical forests, where animal diversity is at its peak and where dense vegetation severely limits visibility. A significant part of animal species produces sound for communication or navigation. Such signals are species-specific, so that they can be exploited for biodiversity censuses as proved by several diversity assessment programs. The current advent of remote acoustic sensors opens the possibility to enlarge the scale of these assessments. Specific case studies conducted in the rainforest of French Guiana reveal the effectiveness of remote acoustic sensing. (1) In the Nouragues reserve, we monitored the population of *Lipaugus vociferans*, a bird that lives near the secluded canopy. In a 48-ha forest area, we deployed an array of 24 microphones that recorded synchronously for 25 days. We detected a total of 12,735 songs scattered in space. The distribution patterns of the songs matched with specific forest features, such as hydrology and vegetation structure. (2) We monitored the ephemeral dynamics of complex amphibian communities

along a 26 km transect. We settled automated recording units in 5 ponds that collected acoustic data for 4 months. We detected 15 events with exceptional acoustic features that lasted between 24h-75h. These events were characterized by specific communities related to explosive breeding reproduction. Long-term tracking of these events can evaluate the stability of these unique amphibian communities. These two case studies reveal that full potential of acoustic monitoring is still yet to be disclosed. A better understanding of the acoustic environment will lead to cost-efficient, repeatable and non-invasive alternatives to measure biodiversity. This long-term, regular and timely data on biodiversity change is critical to comprehend how to improve conservation planning.

ADDRESSING THE CHALLENGES OF MAINTAINING RESEARCH QUALITY WITH VOLUNTEER RESEARCHERS

Jennifer Powell, Cloudbridge Nature Reserve

Eco-tourism and eco-volunteering have become increasingly popular in recent years. As part of this trend, volunteer researchers have also been on the rise. Volunteer workers and researchers allow small conservation projects to take on a wider variety of projects and research than they would be able to tackle with paid staff alone. However, working with volunteers while maintaining quality data collection creates its own challenges. Managers must learn to work with volunteers who have widely varying: skill and knowledge backgrounds, physical ability, dedication and enthusiasm, and expectations. Specific examples of some these challenges and the solutions that have been developed by a small nature reserve in the mountains of Costa Rica are discussed. Challenges discussed include: conducting skill based surveys, maintaining accurate records and reporting, and managing volunteer enthusiasm and dedication.

AFTER A DECADE OF EVALUATING SUBSISTENCE HUNTING IN YASUN BIOSPHERE RESERVE: WHAT IS NEXT?

Hernan Alvarez, Wildlife Conservation Society; Galo Zapata-Rios, Wildlife Conservation Society Ecuador Program

Hunting is still a fundamental activity for indigenous communities in the Ecuadorian Amazon as a way of obtaining wildmeat. However, as a consequence of strong social and economic change, and intensification of this practice in the last four decades, wildlife populations and food security have been put in jeopardy. For this study, we reviewed the literature and research reports (1994 – 2012) that evaluated hunting practices of different indigenous communities inside Yasuni Biosphere Reserve (YBR). Using these sources of data we provide the first attempt to evaluate the overall impact of hunting activities at the landscape scale in YBR. From each study, we filtrated several parameters such as ethnic group, human population size of each community, percentage of community population involved in the study, period of data collection, total biomass (kg) extracted and catchment area (km2). Since hunting interviews were not collected in the same numbers of months, nor the same percentage of households participated in each study, we extrapolated the amount of biomass collected for each study to the total amount of households for community and calculated the average hunting rate per year. Our results showed that on average every 100 people extracted 119.5 kg/km2/year (90% CI, 37.68 – 201.14) of biomass inside YBR. Considering that 87,898 people live inside the reserve and depend on hunting for subsistence, and on average the forests of Yasuni contains 295 kg/km2 and 84kg/km2 of wildlife biomass in areas of middle and high level of human disturbance respectively, our results indicate an urgent need for conservation action. According to our analyses, if hunting rates continue at these levels over the next few years, wildlife populations will decrease drastically affecting not only the integrity of ecological systems but also risking food security of thousands of local people.

AN 18-YEAR STUDY OF WOOD TURTLES (GLYPTEMYS INSCULPTA) IN NORTHERN LOWER MICHIGAN

Alaini Schneider, Central Michigan University, University of St. Thomas; Todd Arnold, University of Minnesota; Philip Huber, United States Forest Service; Timothy Lewis, University of St. Thomas

Wood turtles (*Glyptemys insculpta*) are found throughout the upper Midwestern United States as well as east to the Atlantic Ocean. Throughout their range, numbers are declining such that they are protected in most states and internationally, and the IUCN Red List classifies the Wood turtle as an endangered species. Wood turtles typically inhabit forested streams and make extensive use of riparian habitat. Long-term studies offer numerous types of information useful to resource managers and biologists alike. We studied one population of Wood Turtles in Northern Lower Michigan from 1998-2015, individually marking 260 different turtles (146 females, 88 males, 26 juveniles). We followed 122 of those turtles for multiple years using radio telemetry. We analyzed our encounter data using a Cormack-Jolly-Seber model as applied in Program MARK; and we were able to estimate total population size based on a Bayesian integrated

population model that combined Horvitz-Thompson estimates of annual population size, mark-recapture estimates of annual survival, and derived estimates of annual recruitment. We determined annual adult survival to be 0.970 (SD 0.016) and annual recruitment to be 0.058 (SD 0.019). Over the 18-year study, the population grew from an estimated 770 (95% CI 631-928) to 1196 (95% CI 977-1444) individuals. Overall, we document an increase in population size, providing evidence of a rebounding population after a previously documented historical decline.

AN INTERDISCIPLINARY APPROACH TO GAINING INSIGHTS ON RARE SPECIES: BUSH DOGS IN THE RUPUNUNI, GUYANA

Matthew Hallett, University of Florida; Lilia Roa Fuentes, Pontificia Universidad Javeriana

The bush dog (*Speothos venaticus*) is naturally rare, extremely elusive, and notoriously difficult to study in the wild. Guyana contains a wealth of intact Neotropical forest and savanna habitat, but is one of only two countries with no information on the status of this species. Camera trap studies in the Rupununi Region resulted in the first photos of this species in the wild in Guyana, but nine photographs from three locations generated from tens of thousands of trap nights at >300 sites provides few insights into the status of this species. Capitalizing on the interested generated by sharing camera trap photos with Rupununi communities, we conducted a systematic survey of subsistence hunters, fishers, and farmers that resulted in 84 reports of opportunistic encounters with bush dogs. While camera trap photos provide indisputable confirmation on the presence of this species, reports from key informants resulted new understandings of the biology, ecology, and behavior of this species, as well as unique insights into threats facing bush dogs in the Rupununi and their place in Makushi and Wapichan culture. This interdisciplinary approach allowed access to data outside of the scope and scale of conventional research, represents an inclusive method that engages communities in the research process, and generates information that is directly applicable to the conservation and management of wildlife and wild lands.

ANALYSING MULTI-LEVEL NETWORK GOVERNANCE FOR SOCIAL FORESTRY

Rachel Friedman, University of Queensland; Angela Guerrero Gonzalez, University of Queensland; Kerrie Wilson, The University of Queensland

Governance of the environment and natural resources involves interests and values of multiple stakeholders at different scales. Researchers and practitioners have proffered community-based forest management (CFM) as a model for both protecting forested habitat and biodiversity, and addressing the needs and perceptions of local people. Community members and leaders, government officials, and NGOs may each play active roles in the implementation of CFM; Yet, inequities among stakeholders can also persist due to an unequal balance of influence between institutional levels involved in the development and implementation of such policy measures. With a history of inadequate or even counter-productive approaches to forest management and conservation, it is clear that more emphasis must be placed on accounting for social variables and addressing the growing concerns raised over social equity in conservation. This study aims to better understand the role of institutional actors in community forestry models of governance, using social network analysis to understand cross-scale linkages and participation equitability. Employing a mixed-methods approach with a household survey and interviews with institutional actors in a case study of Indonesian Borneo, it tests claims that CFM is a socially unified and inclusive governance mechanism. Specifically, the study examines how actors external to communities fit into the structure of community forestry governance networks, and what influence those actors wield in shaping the management. Accounting for land cover and forest uses and values, the study connects social and ecological concerns by suggesting implications of multi-level governance network structure for forest conservation outcomes.

ANDEAN BEAR-HUMAN CONFLICTS, IDENTIFICATION OF PRIORITY AREAS IN THE EAST RANGE OF COLOMBIA

Ivan Vela Vargas, ProCAT Colombia, University of Arizona; José González-Maya, ProCAT Colombia/Sierra to Sea Costa Rica; Angela Hurtado-Moreno, ProCAT Colombia; John Koprowski, University of Arizona; Angela Parra Romero, Parques Nacionales Naturales de Colombia; Diego Zárrate-Charry, ProCAT Colombia/OSU

Andean bears (*Tremarctos ornatus*) are being negatively affected by different threats in Colombia including: natural habitat transformation, mostly derived from expansion of production agriculture (i.e., livestock and crop), hinting and conflict derived from predation on livestock. The establishment of livestock near to Andean bear habitat has contributed, not only to habitat loss, but to the emergence of conflicts between *T. ornatus* and farmers whom have invested significant resources. Most studies about conflicts in the country only record the events but have not assessed the spatial patterns of the conflict. Our objective was to generate through ecological niche approach,

a model for identifying potential conflict scenarios in the east range of Colombia based on environmental, landscape and livestock density variables. Based on 4 niche modeling algorithms, we generated a conflict risk geographical ensemble model for Andean bears. The variables with greatest contribution were elevation, cattle density, distance to disturbed areas and distance to human settlements. We identified that areas adjacent to protected national parks have high probability of conflicts and socioeconomic indicators are consistent with the spatial patterns. Here we present the first geographical model of risk prediction for Colombia. The use of ensemble models can help identifying priority areas and alert environmental agencies to create mitigation and prevention tools to avoid these interactions. Our findings can be applied to more accurately evaluate Andean bear-human conflict in the east range of Colombia.

ANTHROPOGENIC INTERACTIONS INCREASING MORTALITY OF CETACEANS IN LAKE MARACAIBO, VENEZUELA

Leonardo Sánchez-Criollo, Instituto Venezolano de Investigaciones Científicas; Yurasi Briceño, Venezuelan Institute for Scientific Research; Izabela Stachowicz, Instituto Venezolano de Investigaciones Científicas

The increase of incidence of cetacean stranding in the Zulia State coast has been notable during last decade, with the majority represented by dolphin of Maracaibo Lake, *Sotalia guianensis*. In order to make a detailed record of these events and to determine the possible mortality causes, field data were collected from interviews with fishermen and the inhabitants of the coast of Maracaibo Lake (northern and southern regions and the eastern coast). Interviews were also conducted with environmental officials and periodic tours of the coast. In addition, reports issued by the Ministry of the Environment, NGOs and the University of Zulia were reviewed, as well as regional and national press reviews from January 2004 to December 2016. In total 187 cetaceans stranding were registered, most of the *S. guianensis*. In most cases (56%) the anthropogenic intervention was evidenced, 30 % of the cases were related to intentional capture for consumption and commercialization purposes; the remaining catches were attributed to incidence caused by fishing nets. This investigation permitted identification and deletion before the competent authorities of existed organized groups dedicated to the hunting and trade of cetaceans and other mammals in the Maracaibo Lake. In 2016, the Venezuelan military authorities succeeded in capturing and imprisoning one of these organized groups. Some fishermen pointed the economic crisis forced them to make captures of cetaceans for subsistence purposes. It is suggested to start genetic forensic studies to detect the sale of cetacean meat in the city of Maracaibo as well as to reinforce surveillance and control practice.

ANURAN FUNCTIONAL DIVERSITY IN A DISTURBED AND ENDANGERED DRY FOREST ECOSYSTEM IN COLOMBIA

Oscar Ramos, Universidad de La Salle; Yenny Pedroza, Universidad de La Salle; Alexandra Delgadillo Méndez, Universidad de La Salle

The dry forest ecosystem in the Chicamocha Canyon (Colombia) is one of the most endangered in the country, threatened by the change in the land use and the loss of water sources. In order to understand how anuran diversity, respond to environmental stress and human disturbance, we evaluated functional diversity which quantifies the value and range of organismal traits that influence their performance and thus ecosystem functioning. We calculate functional diversity indexes and compare functional groups composition between three stream ecosystems located along an altitudinal gradient (300 – 1800 masl) in which use of land is also variable. Our results show that in this area, functional diversity in anurans was low. However, we found that functional diversity was related with altitudinal gradient, where the driest ecosystems presented lower values of diversity. Additionally, ecosystems with highest levels of disturbance had less functional diversity. Finally, it was evident that stream ecosystem is playing a key role as source of dry forest ecosystems diversity. Based on these results, it is mandatory to implement conservation strategies to protect stream ecosystems associated with dry forests, and in this way, maximize the functional diversity and help to protect the fragile dry forest ecosystem.

ARE BIG CATS SAFETY IN PROTECTED AREAS IN VENEZUELA? SITUATION ON SOUTHWESTERN LAKE MARACAIBO BASIN

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The Ciénagas de Juan Manuel National Park and Ciénagas de Juan Manuel, Aguas blancas y Aguas negras wildlife reserve, both located in the southwestern Lake Maracaibo basin, Zulia state, are characterized by grasslands and forests of palm swamps and marshes, which occupy only 0.56% and 2.5% of the terrestrial area of the country,

respectively. They have been listed in the Red Book of Terrestrial Ecosystems Venezuelan as Near Threatened (NT) for the Zulia state. Due to conversion of natural habitat to urban development, cattle rising, and agriculture, mainly of African oil palm monocultures or banana plantations, jaguars and cougars are limited to the National Park and Wildlife Reserve, suffering increase in conflicts with humans who live in these protected areas. The human population in the area is conformed mainly by fishermen and farmers. The objective from this job is to know frequency of hunt of big cats in the area and methods used for them. We interview 15 fishermen and 17 farmers of which 19 hunted jaguars and cougars, 13 did not hunted big cats. The hunters explained two methods: 16 hunted with shotguns mainly at night in the forest or near the farms, and 3 fishermen hunted while cats are crossing the river (1 jaguar and 1 cougar), beaten with oars in the head and taken for tail and drowned. The reports of hunts in big cats are really worrying because only 7 farmers said that they killed these cats by consumption of dogs and livestock, other was killed for placer in many occasions in the last ten years (1cat/2years). Is necessary to interview more people and to do environment education for decrease this hunt or establish methods to minimize the conflict with big cats.

ARE TROPICAL VERTEBRATES LIVING IN STRESSFUL ENVIRONMENTS? A QUANTITATIVE REVIEW

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A central prediction in studies that evaluate the effect of anthropogenic disturbances at physiological level is that glucocorticoid levels (GCs) of animals living in disturbed habitats are higher compared to undisturbed habitats, as a response to a persistent stressor. This might be detrimental to the organism and result in reduced survival and fitness. Yet, previous reviews on this topic have underrepresented tropical studies and have failed to include common tropical anthropogenic disturbances, such as human-wildlife conflict, logging and hunting. We performed a meta-analysis to examine the effect sizes of anthropogenic disturbances (land use, harvesting, human conflict, noise and tourism) on GCs levels. We obtained 43 effect sizes from 22 published studies recording GCs of vertebrates inhabiting disturbed and undisturbed habitats. Across all vertebrate taxa addressed here, species exposed to human disturbance had significantly higher glucocorticoid levels compared to undisturbed habitats (overall weighted-mean effect size = -0.72, 95% CI = -1.05 to -0.39). But taxa of Aves (n = 2), Reptilia (n = 2) and Amphibia (n = 0) were underrepresented in our dataset. In contrast to temperate regions, mammals and not birds were the most studied species. Furthermore, the only disturbance types showing a significant negative effect were land use and human conflict. We confirmed that human disturbance is associated with an increase in GCs levels but do not all types of human disturbance. This finding suggest that we cannot assume that the relationship between anthropogenic disturbances in the tropics and bio-indicators of physiological stress is consistent across any type of human disturbance. More studies focused on amphibians are needed as well as those assessing understudied threatens in the tropics, from the physiology stress perspective, mining, pollution and invasive species.

ASIAN WILD BUFFALO, BUBALUS BUBALIS ARNEE (LINN), REINTRODUCTION IN NEPAL: A HISTORICAL MILESTONE IN SPECIES CONSERVATION

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In January and February 2017, the Government of Nepal successfully translocated 12 (10 females and 2 males) Asian wild water buffalo (*Bubalus b. arnee*) from Koshi Tappu Wildlife Reserve (175 km2) and three (2 females and 1 male) from the Central Zoo to their former range in Chitwan National Park (932 km2). The Asian wild water buffalo is the ancestor of all the domestic water buffalo varieties and is one of the members of Bubalus species which was widely distributed in Europe and southern Asia in the Pleistocene period. Currently, the Asian wild water buffalo is globally endangered, and a protected species in Nepal by the National Parks and Wildlife Conservation Act 1973. The species is also listed in CITES Appendix II. At present in Nepal, due to poaching and habitat loss, the species is confined only within the Koshi Tappu Wildlife Reserve. The objectives of the translocation were to 1) protect this species from the risks of climatic and non-climatic disasters including stochastic events and diseases as the small population of this species is confined within a narrow space of the reserve; 2) allow the species to assist in the natural maintenance of water holes by regular use and convert tall alluvial floodplain grassland used

by rhinoceros and other medium sized ungulates; and 3) restore the original large mammal assemblage and increase tourism value.

ASSESSING THE IMPACT OF ANTHROPOGENIC ACTIVITIES ON BIODIVERSITY IN HUASCARAN NATIONAL PARK, PERU

Jessica Gilbert, Texas A&M University

Global climate change and the anthropogenic intensification is threatening the ecological integrity of alpine ecosystems, the biodiversity that depends on them, and the human uses they support. Although alpine ecosystems provide a range of cultural and biological resources, they are severely understudied. In response to GCC, species range distributions are shifting in relation to their environmental tolerances, with cold adapted species moving to higher elevations. Tropical glaciated ecosystems such as the Cordillera Blanca of Peru are particularly vulnerable to the effects of GCC and human intensification. In this system, agricultural intensification may push species to higher elevation patches, leading to reduced ecological connectivity and population isolation. In addition to changes for wildlife, livestock are moving to higher elevation, alpine grasslands in response to resource scarcity and pasture degradation caused by overgrazing. The following research is an assessment of the impact of livestock grazing on biodiversity in alpine ecosystems in Huascaran National Park, Peru. From May-September 2016 mammal presence was determined using camera trap surveys, hair snares, and scat collection. Species occupancy ($\Psi$was assessed using the 'unmarked' package in R.3.3.3 to determine species detection probability and proportion of sites occupied by each species. Diel activity patterns for each species was calculated using kernel density estimation. Occupancy and activity patterns for each species were compared between 'pristine' sites and sites with livestock grazing activity. We found that occupancy and diel activity patterns of carnivore species were affected by the presence of livestock activity. In addition, we documented the IUCN endangered Andean cat (*Leopardus jacobita*), representing a range expansion for this species. Understanding the shifting dynamics within these fragile systems is crucial to biodiversity conservation and management.

ASSESSING THE IMPACTS OF APEX PREDATOR REMOVAL IN COMPLEX ECOLOGICAL, ECONOMIC AND SOCIAL SYSTEMS

Leejiah Dorward, University of Oxford

Apex predators can impart strong top down pressures on food webs; regulating populations of mesopredators, primary consumers and producers. Large predators are frequently persecuted due to real or perceived threats to the lives of livestock and humans who live near them. There has been very little research into the ecological, economic and social impacts of the trophic cascades that may occur as a result of carnivore persecution. Using a trophic model containing predators, mesopredators, herbivores, livestock, crops and natural vegetation we investigate the potential trophic cascades caused by large carnivore suppression. Parameterising this model for a range of different ecosystems containing persecuted predators allows us to investigate potential ecological feedbacks that result from reduced numbers of large carnivores and how these might impact local human communities. For instance; how changing levels of predation from apex and meso-predators on herbivores impacts levels of crop raiding or competition for natural forage with livestock. These ecological interactions connect to complex economic and cultural systems and improving our understanding of the ecological impacts of carnivore persecution allows better identification of the costs and benefits associated with living alongside carnivores.

ASSESSING THE IMPACTS OF HATCHERIES ON GREEN TURTLE HATCHLINGS

Carmen Mejías Balsalobre, Durrell Institute of Conservation and Ecology

Hatcheries are a common conservation strategy used to protect sea turtles' eggs. However, the effectiveness of these programmes has been questioned, as they have serious limitations that can negatively affect turtle populations. Since the closure of hatcheries in countries such as Sri Lanka would be impractical, there is a need for improving the poor practices employed in most of them. One such practice is to retain the hatchlings for several days as a tourist attraction. In nature, hatchlings emerge in a frenetic state and crawl to reach the sea and get away from shore as quickly as possible to avoid predators. Hatchling retention in hatcheries may result in a depletion of their energy reserves, thereby reducing their chances of survival. This study investigated the effects of such retention on different quality parameters of green turtle (*Chelonia mydas*) hatchlings. Hatchling body condition, crawling speed and swimming power stroke were examined at intervals during the hours of retention. The results indicate a detrimental effect on locomotor performance. Average hatchling speed was reduced by 26% after 24 hr, and 27% after 48 hr of retention. Power stroke rate also decreased by 10% after 12 hr and up to 16% after 48 hr. Size index of hatchlings after swimming trials was the only body measurement

that recorded a significant change over hours of retention, but was relatively small (an increase of 8%) and therefore unlikely to play a major role with regard to predation. The results of this study provide experimental evidences of the importance of hatcheries releasing hatchlings immediately after emergence to maximize their chances of survival. However, they should also be considered in the light of the other contributions hatcheries might make to sea turtle conservation through public awareness, education and conservation revenue generation.

ASSESSMENT OF THE VULNERABILITY OF FRESHWATER CRAYFISH TO CLIMATE CHANGE

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Climate change is emerging as one of the major threatening processes to the persistence of biodiversity on earth. Global assessments of climate change vulnerability highlight the most climate-vulnerable species and geographic regions and can promote effective conservation actions. Yet the majority of climate change vulnerability assessments (CCVA) have focused on terrestrial and marine species, and largely ignored freshwater species and invertebrates. We present the first global analysis for 574 species of freshwater crayfish using IUCN's trait-based approach. We collected species-specific information on sensitivity (9 traits), adaptability (4 traits), and exposure (5 traits) to climate change and combined those to assess the overall vulnerability. Based on an ensemble of four general circulation models for a moderate IPCC emission scenario (rcp6.0), our results predicted that 87 % of species are highly sensitive to climate change, primarily due to habitat specialization, 35 % have poor adaptive capacity and 57 % are highly exposed. Overall, 87 species (15%) assessed are predicted to be highly vulnerable to climate change. Climate change-vulnerable species are distributed globally, with high concentrations found in south-eastern USA (36 species), Mexico (10 species) and the south-east of Australia (21 species). Species identified as climate vulnerable by our trait-based framework differ from those identified by experts in the IUCN Red List. Out of the 87 of our climate change-vulnerable species 50 are also included in the IUCN Red List as threatened species. Fewer species were found to be vulnerable under lower IPCC emission scenarios, indicating that reducing greenhouse emissions may reduce climate impacts on crayfish species. We found that climate change vulnerability was lower in crayfish than in terrestrial species. This study contributes to the application of CCVA to poorly-known, range restricted invertebrates using freshwater crayfish as a case study.

ASSORTATIVE MATING IN INTRODUCED ASIAN BLACK BEAR (URSUS THIBETANUS) IN KOREA

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Large mammals potentially conflicting with human's present challenges for conservation and management programs. Bear populations have been decreasing in size, with several cases of local extinctions and hybridizations. Reintroduction programs generally encounter difficulties, while the reintroduction program started by South-Korea National Parks displayed an unusual success. A population of six individuals was introduced in Jirisan National Park in 2004, with additional individuals introduced from North-Korea, China and Russia for a total of 23 introduced bears in 2015. A total of 28 cubs were born in the park between 2004 and 2016, out of 19 broods, involving females from China (n = 3), North-Korea (n = 5), and Russia (n = 11). Fathers are known for 15 cubs only, from 11 broods, and no male bear originating from China was involved in siring any known offspring. Here we hypothesize segregation of mating individual by geographical origin. The birth rate was on average 2.8 (min = 1, max = 6) cubs per breeding females, and 2.5 (min = 1, max = 4) cubs per breeding male, over the study period. A total of 12 out of 15 cubs had parents of same origin (11 Russians and one North-Korean) and three cubs were of mixed origin. Within the cubs of mixed origin, one was mixed Russian and North-Korean, while the two others were mixed Chinese and Russian (mothers and fathers respectively). Thus, the probability of mating between individuals from different origin deviated from random (Likelihood Ratio test; $\Psi = 8.13$, df = 2, p = 0.017). Assortative mating allows for the continuity of genetically consistent units through pre-mating isolation. Here, partial assortative mating is expected to delay gene transfer, and thus enable the future larger population to conserve a wider genetic diversity.

AWARENESS, KNOWLEDGE AND PERCEPTIONS ABOUT WETLANDS AMONG RESIDENTS OF WETLAND COMMUNITIES IN GHANA

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Wetlands provide important ecosystems services. Despite their importance and value, it is estimated that half of the world's wetlands have disappeared since 1900.

A lack of awareness about wetland values have often led to their degradation or transformation. This study explored awareness, knowledge and perceptions about wetlands in some communities surrounding four coastal ramsar sites in Ghana: Sakumo, Keta, Muni-Pomadze and Songor Ramsar Sites as well as threats and pressures on the wetlands through structured questionnaire surveys. The main findings of the survey suggest that 61.1% of respondents were aware of the presence of wetlands in their community, however only 48.5% were aware that the wetland is protected. Wetland awareness was higher among males (69.3%) than female respondents (30.7%). Only 93 (16%) of surveyed respondents had knowledge about formal regulations regarding the use of the wetland whereas 375 (64.5%) were aware of traditional regulatory strategies. Majority of respondents considered irregular rains, encroachment and drought as the key threats to the wetlands. The major differences in awareness and knowledge of wetlands among respondents are primarily reflections of differences in the education, types of settlement and occupation of populations surveyed. Thus, Fishermen whose livelihood are directly linked to the use of the wetland (Fisher's test=26.945, $p<0.05$, df=1), respondents from urban communities (Ψ=89.898, df=5, $p<0.05$) and respondents with secondary level education (Ψ=42.207, df=5, $p<0.05$) were more knowledgeable about wetlands. In order to ensure wetland conservation, community understanding and appreciation through education is necessary. Reinforcement of traditional and formal regulations can also be used to serve as backstop.

AZE MEXICO: A NEW LIST TO CONTRIBUTE WITH SPECIES CONSERVATION

Edgar Saavedra, CONABIO; Esther Quintero, CONABIO; Carmen Valera-Bermejo, CONABIO

The Alliance for Zero Extinction (AZE) promotes biodiversity conservation through the identification of highly threatened species with a restricted geographical distribution in order to preserve them. In order to become an AZE trigger species, a taxon must have been assessed as Critically Endangered (CR) or Endangered (EN) by the International Union for Conservation of Nature (IUCN), and must be restricted to small, discrete areas. Currently the global AZE listing comprises 920 trigger species in 590 AZE sites. Mexico, as one of the 85 countries in this initiative, has a list of 150 trigger species distributed in 68 sites. Starting in 2015, the National Commission for Knowledge and Use of Biodiversity (CONABIO) along with researchers from the Instituto de Biologia UNAM (IBUNAM), started working on the reassessment of the Mexican AZE trigger species and sites. As the methodology in use restricts the inclusion of many Mexican species that although imperiled have not being assessed by the IUCN, we proposed a new way to identify trigger species including expert knowledge, the inclusion of evolutionary lineages rather than relaying only on biological species, species with unique biological phenomena such as migrations, and species vulnerable to climate change. Results from this assessment have until now identified 110 new trigger species for Mexico, including for the first time 33 invertebrates and 17 freshwater fishes, while incrementing the number of plants and reptiles in more than 900%. From some of the new trigger species at the moment we have identified four new AZE sites for the country, including two lagoons, one island and part of a desert dune system.

BALANCING FRESHWATER NEEDS OF HUMANS AND ECOSYSTEMS IN THE MARA RIVER BASIN, TANZANIA

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The Serengeti – Lake Victoria (SELVA) Sustainable Water Initiative addresses the challenge of providing water security to ecosystems and human populations in the lower Mara River Basin, Tanzania. The Mara River Basin (MRB), shared between Kenya (65%) and Tanzania (35%) and part of the larger Lake Victoria watershed, drains some of the Earth's most important biodiversity areas and supports some of the world's most distinct cultures. Freshwater is a resource that underpins the integrity of ecosystems in the MRB and influences the health, economy, and cultural traditions of the basin's human inhabitants. To better understand ecosystem and human needs for freshwater, an environmental flow assessment of the MRB in Tanzania was conducted between 2010-12, and a socio-environmental inventory was realized in 2016. Results from these two efforts provided evidence of strong linkages between the hydrology and ecology of the lower Mara River Basin, and identified strengths and assets of human populations that could assist with implementation of sustainable water management strategies. Limited information on water quantity and quality of the Mara River presents a challenge to sustainable water management; to address these limitations, a pilot network of low cost remotely-sensed water monitoring stations was established in 2016. Here we share results and lessons from these efforts to balance human and ecosystem needs for freshwater in the lower Mara River Basin, Tanzania.

BETA DIVERSITY OF SELECTIVELY LOGGED TROPICAL FOREST SOUNDSCAPES IN BORNEO

Zuzana Burivalova, Princeton University; Timothy Boucher, The Nature Conservancy; Eddie Game, The Nature Conservancy; Bronson Griscom, The Nature ConservancyPurnomo Purnomo, The Nature Conservancy; Michael Towsey, Queensland University of Technology; Anthony Truskinger, Queensland University of Technology

Selective logging, the most common form of tropical forest management, changes not only the local number of species, but also likely the species turnover (beta diversity). Impacts on faunal beta diversity are largely unknown, due to the intensive sampling requirements. By using ecoacoustic, we measured the dissimilarity in soundscapes of tropical forest sites under varying types of forest management in the Indonesian part of Borneo. We recorded the soundscapes of 75 sites in pristine and selectively logged forest. We found that the soundscapes of selectively logged forests, regardless the number of logging cycles and time since logging, are significantly more homogeneous than the soundscapes of pristine forest, at all times of the day, and at all frequencies. There is little indication that soundscape heterogeneity across space recovers with time that elapses from logging. Further, during the dawn and dusk chorus, the acoustic activity in terms of soundscape saturation is on average higher at sites that had never been logged, compared to sites that had been selectively logged within the last 3 years. This relationship is reversed at night. Our findings on dissimilarity and soundscapes saturation suggest that selective logging likely leads to subtractive homogenization of the vocalizing diurnal fauna, and potentially to additive homogenization of the vocalizing nocturnal fauna. Our results, if corroborated in other tropical forest regions, would have important implications for the management of tropical forests for timber: on top of regulating the logging intensity, which influences changes in alpha diversity, managers should take into account the total continuous area that is assigned to selective logging, to minimize losses to the total, gamma diversity of a region.

BIG DATA FOR CONSERVATION: MODELLING THE DISTRIBUTION OF WILDLIFE WATCHERS USING SOCIAL MEDIA

Francesca Mancini, University of Aberdeen; George coghill, University of Aberdeen; David Lusseau, University of Aberdeen

Wildlife watching activities are now recognised as potential threats to the targeted wildlife. More than 5000 species listed on the IUCN Red List of Threatened Species are affected by tourism, and over 1000 of these species are Endangered or Critically Endangered. It is therefore extremely important to quantify these recreational activities in order to identify areas of conflict between humans and biodiversity, where high visitation could jeopardise the conservation status of the wildlife. The widespread use of the Internet and social media offers the opportunity to use the data generated by their billions of users. In this study we used pictures of wildlife posted on the photo-sharing website Flickr to quantify wildlife watching activities in Scotland. We then tested the effect of different environmental variables on the number of tourists visiting a certain area, such as the presence of different types of nature reserves or protected areas, and the presence of different types of infrastructures. The results show that both the presence of protected areas and of tourism infrastructure explain the distribution of wildlife tourists in Scotland. Some types of protected areas, such as Marine Conservation Areas, are a strong attractor for tourists while other types of reserves don't have an effect on volume of tourism. Perceived wilderness of a site is a deterrent, even for specialised tourists such as wildlife watchers, while hotels and dedicated wildlife watching tour operators are the most important infrastructures for tourists. By using this novel data collection technique, we were able to make more precise inference on tourists' preferences on larger areas. This information has implications for management and for conservation. It can be used to identify areas that are particularly vulnerable due to tourism pressure and need to be protected, thus helping with conservation prioritisation, and to inform sustainable planning of tourism development.

BIOCULTURAL CORRIDORS: EXPLORING SOCIAL AND ECOLOGICAL CONNECTIVITY IN AMAZONIAN ECUADOR

Michael Esbach, University of Florida

In Ecuador, some of the richest rainforests in the world are controlled by indigenous Cofán communities. While much of their once-vast territories have been colonized, Cofán leaders have fought to protect the still-intact areas of forests that survive. To date, they have recovered the rights to over one million acres of their ancestral landscape within five geographically distinct territories. Despite these gains, some Cofán territories are becoming increasingly isolated as they are surrounded by agricultural fields and a network of roads. Ecologically, these areas could be too small to maintain viable populations of key mammal species. Socially, this isolation could limit indigenous knowledge of their cultural landscape and traditional resource management techniques. Connectivity between these territories is therefore increasingly important for both food security and Cofán cultural heritage. I define

connectivity as the manner and extent to which resources, species, or social actors disperse, migrate, or interact across ecological and social landscapes. Given this context, this study aimed to better understand social and ecological connectivity between Cofán territories. To do this, I worked with Cofán partners to (1) develop a map that documents the Cofán's long interaction with the landscape through settlement sites, natural resources, and sacred places. I then used statistical and modelling approaches to (2) map and quantify land-use change patterns from 1990-2010, (3) design a network of potential connectivity corridors for four mammal species that are culturally significant and/or important food sources, and (4) identify a biocultural corridor that maximizes the needs of mammal species and overlaps with previously identified cultural sites. Results from this work will reinforce the Cofán's cultural linkages to their landscape and allow them to prioritize future conservation efforts around areas that can potentially increase biocultural connectivity.

BIOCULTURAL PLACES FOR TRANSFORMATIVE COMMUNITIES AND PROTECTED AREAS: CO-INVESTIGATION IN COLOMBIA

Jennifer McRuer, UofS, DICE; Javier Maldonado-Ocampo, Pontificia Universidad Javeriana

Critical place issues threaten biological and cultural diversity and degrade the integrity of interdependent place relations that potentiate well-being and sustainability. In response to these threats, this research considers the ways human life is connected to and dependent on other species, the land, and the sea. It further considers how these relationships affect collective well-being and sustainability. With this focus, this poster presents community-based research that involved co-research with six youth living in Isla Grande, Colombia—an archipelagic community surrounded by the Corales del Rosario and San Bernardo Natural National Park, and associated Marine Protected Area. Our research aimed to promote collective biocultural heritage in this context to inform sustainable development and conservation agendas. This importantly contributes to Isla Grande's 16-year struggle toward self-determination of ancestral territories and rights to co-governance. Youth co-researchers' perspectives on place interdependence are illustrated through methods of photovoice and participatory mapping that captured their connections with ancestral territories of land and sea. Place interdependence is specifically related to a UNESCO–SCBD biocultural framework on how language, material culture, knowledge and innovations, social and economic relations, and beliefs are interconnected with biodiversity. Local implications include supporting current efforts in the site community to re-imagine and transform place relationships to respond to critical place issues. Protected area implications include the need to uphold international conventions and agendas that support community self-determination and co-governance. Particular reference is made to CBD targets 15, 8j, 10c, and 17.2; Aichi Target 11; and the UN Sustainability Development Goals.

BIODIVERSITY PATTERNS IN A MOSAIC LANDSCAPE IN SOUTHERN BELIZE

Said Gutierrez, Yaaxche Conservation Trust; Marchilio Ack, Yaaxche Conservation Trust; Karla Hernandez Aguilar, Ya'axche Conservation Trust

The development of small countries like Belize often comes with changes to the natural landscape and the flora and fauna it harbors. With approximately 60% of its forest cover still intact, Belize contributes greatly to the biodiversity of the Central American region. Southern Belize retains much of its original forest, most of which is found under some level of protection within the national protected areas system. The Toledo District retains about 70% of its land areas under forest cover with the remaining 30% under some form of agriculture practice. Thirty-one indigenous communities dot the landscape and are heavily dependent on traditional slash and burn agriculture. This agricultural practice has increased dramatically with over 6,000 acres of forest cleared in the last three years to accommodate its expansion. With fallow periods shrinking from 15 years to as little as 3 years, more areas are cleared every year in search of fertile soils. The landscape has been left fragmented and in various degrees of regeneration. This study looks at bird and mammal diversity and abundance across the landscape using a citizen science approach. Forest rangers, all from the indigenous communities, were trained, equipped and employed in biodiversity data collection for over six years. Here we present the results of six years of citizen science efforts in southern Belize. Species richness for birds and mammals have remained consistent over the last six years despite the pattern of habitat fragmentation, which suggests that a high level of connectivity is still present within the landscape. If deforestation continues at the rate it has been increasing over the past 3 years, the current levels of biodiversity are likely to change the near future. We recommend the continued use of citizen science as an effective tool for biodiversity monitoring and a method to promote stewardship of natural resources and contribute to conservation efforts.

BIRD COMMUNITY RESPONSES TO A CHANGING BUILT URBAN FORM: CONSERVATION ON SPRAWLING TO COMPACT CITIES

Juan Amaya-Espinel, Instituto Alexander von Humboldt, Pontificia Universidad Javeriana; Cristian Bonacic, Fauna Australis Puc

Environmental cost and benefits resulting from processes involving urban development of sprawling or compact cities are subject of debate worldwide. However, how bird communities respond to these contrasting types of urban forms is still relative unknown. We compared richness and abundance patterns of bird communities in 60 small green areas of Santiago of Chile surrounded by different types of built urban form (BUF). Likewise, we compared the specific contribution on these bird community patterns of features describing BUF at matrix scale (built density, built height, roads coverage) and those describing features of each small green areas at local scale such as size, habitat composition and structure, and human perturbation. Our results suggest that densification and compaction of a city have major negative effects on urban bird communities than those associated to a sprawling development. We found that built density and human perturbation (noise and pedestrian traffic) are the main urban form features affecting bird community richness and abundance patterns. The increase on these variables, had a negative impact on birds that are considered native, avoiders, adapters, insectivorous and cavity nesters species. On the contrary, birds classified as exotic, exploiters and omnivorous tended to be favored for this change in terms of higher abundances. However, the magnitude of these effects was modulated for the quality and quantity of the vegetation persisting in each small green area, reducing losses of native and avoider species. We expect that these results contribute to a better management of the ecological impacts and the biodiversity conservation on contrasting development urban scenarios.

BIRD-BASED TOURISM AS A CONSERVATION AND ECONOMIC DEVELOPMENT TOOL WITH PEACE AGREEMENT IN COLOMBIA

Gloria Lentijo, National Audubon Society; Jorge Maldonado, Universidad de los Andes; Aaron Bruner, Conservation Strategy Fund; Sophía ESPINOZA, Conservation Strategy Fund; Natalia Garzón, Universidad de los Andes; Rocio Moreno, Conservation Strategy Fund; John Myers, National Audubon Society

Colombia is the country of birds. With more than 1900 species, potential for bird-based tourism is enormous. Our results suggest that Colombia's peace agreement will generate significant economic development through birding and provides the country with a major incentive for promoting bird conservation. Using contingent valuation method, we surveyed members of the National Audubon Society who would be willing to pay, on average, an additional $60 per day and per person for a tour inside Colombia, as compared to a similar tour in terms of duration and services in Costa Rica, currently one of the main tourism destinations for birders. The estimated demand is of 278,850 American bird watchers that would be interested in visiting the country, generating an annual profit of $9 million and 7,516 new jobs. This potential and growing importance of tourism as a generator of economic development to communities once affected by the conflict, also poses challenges for territorial planning, for management of bird-tourism destinations and for bird conservation. To face these challenges, we have developed a model for a National Network of Birding Trails, defined as a network of important sites for birdwatching and communities, that form a regional destination, that promotes local economic development and biodiversity conservation. This model emphasizes on building capacity to local communities and tour operators to ensure profits for their communities and financial mechanisms to support conservation of important ecosystems for birds. To date, we have trained 43 bird guides of three communities in the Colombian Caribbean coast and two new entrepreneurships of local bird-tourism services have been formed and running with great success in the region. These results have influenced a National Strategy for Bird Tourism that was launched in 2016 by Colombia's ministry of Commerce, Industry and Tourism, establishing the goal of being the world's top birding destination by 2021.

BUFFER ZONES AS KEY AREAS TO HELP TO CONSERVE BIODIVERSITY

Shirley Serrano-Rojas, Crees Foundation

The importance of buffer zones for biodiversity conservation is poorly understood and conservation efforts mostly focus on protected areas. However, the success of these core areas depends heavily on managements of their surroundings. The Manu Biosphere Reserve is one of the most biodiverse places on earth. Currently, destructive practices such as logging are dramatically affecting its buffer zone. The result is an unsustainable downward spiral of environmental degradation that both reduces rainforest biodiversity and decreases long-term economic returns for local people. We selected six areas to determine current amphibian biodiversity patterns throughout the Biosphere Reserve, chosen to best represent typical current land uses: 1) a primary forest control site, 2) a regenerating rainforest site, 3) three native community lands and 4) an agricultural matrix. We estimated species richness, diversity

and community evenness and structure for each site. Our results show that as a whole, the buffer zone holds an incredible proportion of amphibians known to exist in Manu. We detected 70 species of amphibians (57%) of the 123 species ever recorded in Manu in the elevations surveyed within our study. However, only 17 species were recorded within the agricultural matrix site, which suggests that increasing degradation through expanding agriculture could be a major threat to maintaining these levels of biodiversity within the buffer zone. We show buffer zones to be important. Therefore, we propose that in order to maximise the protection of biodiversity in the Manu Biosphere Reserve buffer zone, alternative solutions to extensive clearance and intensive agriculture need to be available to local peoples living in the region. As such, we urge authorities from protected areas and buffer zones to work together to investigate the best social and sustainable opportunities for both local people and biodiversity to co-exist in the forests throughout the entire Biosphere Reserve.

CAN WILD CARNIVORES PERSIST IN A HUMAN DOMINATED LANDSCAPE?

Libertad Orozco, Instituto de Ecología A.C.; José Cuauhtémoc Chávez-Tovar, Universidad Autónoma Metropolitana; Rurik List, Universidad Autonoma Metropolitana; Andrés Mauricio López-Pérez, Universidad Nacional Autónoma de México; Carolina Valdespino-Quevedo, Instituto de Ecología A.C.

The mountain range known as Sierra de Las Cruces (SC), which separates the cities of Mexico and Toluca, is the most important source of ecosystem services for more than 20 million people, but land use change has dramatically reduced and fragmented the remaining native habitats. Domestic dogs (Canis lupus familiaris), are exotic species which can negatively affect wildlife by competition, predation and by being vectors of disease, all of which can lead to local extinctions. Carnivores provide services like pest control and seed dispersal. The aim of this work was to assess if landscape disturbances associated with human presence have an impact on wild carnivores. With camera traps we recorded the presence and abundance of native carnivores in SC, and used GLMs to determine if the distance from each camera to the nearest paved road and human settlement had an effect on the presence of wild carnivores. We also determined the activity patterns of the most abundant carnivores and evaluated the overlap between them. We found a surprisingly complete community of carnivores, and unexpectedly we found domestic dogs to be up to five times more abundant than the raccoon (Procyon lotor), the most common native carnivore. Abundance of the reminder 9 native carnivores recorded was low. The model shows that distance to the edge of the forest had an effect over ring-tailed cats. Some wild species may be adapting better to human disturbances by exploiting human resources more effectively. The presence of dogs also seems to be having an effect on the presence of bobcats, and their activity patterns overlap. While our data is not enough to assess the effect of dogs over wildlife, the abundance and wide distribution of dogs in the SC raises a flag keep monitoring the remaining patches of natural habitat where humans, domestic animals and wildlife coexist.

CHANGES IN THE COMMUNITY STRUCTURE OF DROSOPHILIDS (INSECTA, DIPTERA) ACROSS TWO FOREST FRAGMENTS

Francisco Das Chagas Roque, Instituto Federal de Brasília (Campus Planaltina)

Forests of the Brazilian savanna (a world hotspot) occupy only 5% of this biome, but harbor its greatest biodiversity. Despite of this, they are relatively understudied and extremely threatened by anthropogenic pressures (fragmentation, deforestation, and fire). Here, we investigated the community structure of drosophilids associated with two forest fragments with contrasting degrees of conservation in the Brazilian savanna. We collected adult drosophilids during October–December 2014 from a quite degraded forest (QDF) located in downtown Paracatu, Minas Gerais, Brazil, and a relatively preserved forest (RPF) located approximately 5 km from Paracatu downtown. We sampled each forest using five retention traps exposed for three consecutive days. Captured flies were identified specifically and statistically significant differences in the proportions of exotic (EXO) and neotropical (NEO) drosophilids between forests were assessed using the Chi-squared test (Contingency Table). Overall, we caught 4,020 drosophilids representing 21 species of the genera *Drosophila Fallén, Rhinoleucophenga Hendel, Scaptodrosophila Duda,* and *Zaprionus Coquillett*. The observed species richness did not change across the forests (QDF: 17; RPF: 15). The total abundance, in turn, changed (QDF: 3,433; RPF: 587). The proportions of EXO and NEO varied at each forest (EXO: Chi-squared=293.31; df=4; p=0.0001 - NEO: Chi-squared=87.331; df=9; p=0.0001) mainly because EXO accounted for approximately 90% of the total abundance in QDF and approximately 60% in RPF. Therefore, our data also support the hypothesis that exotic drosophilids are more common in disturbed environments since these species were numerically higher in QDF. Thus, forest encompassing the urban matrix may have lost most of its environmental quality deserving immediate legal protection of its biological resources whose loss or additional alteration

may contribute to a reduction of the heterogeneity and biodiversity of the Neotropics.

CHANGING LENSES TO MONITOR FOREST BIODIVERSITY: NEST WEBS AS COMPLEX SYSTEMS IN THE AMERICAS

José Tomás Ibarra, Centre for Local Development, Pontificia Universidad Católica de Chile; Tomás Altamirano, Pontificia Universidad Católica; Cristian Bonacic, Fauna Australis UC; Kristina Cockle, Universidad Nacional de Salta; Kathy Martin, University of British Columbia; Suzanne Simard, University of British Columbia; Yntze van der hoek, Universidad Regional Amazónica IKIAM

A single dominant objective (e.g., flagship or threatened species) usually shapes the "lenses" through which biodiversity is assessed and managed in forest ecosystems. However, forests are Complex Adaptive Systems (CAS) in which patterns at higher levels emerge from localized networks of many entities (species, guilds) interacting at lower levels. Tree cavity-nesting communities exist within interaction networks known as "nest webs" that link trees, excavators (e.g., woodpeckers), and secondary cavity nesters (e.g., many songbirds, ducks, raptors, and other vertebrates). Despite growing acknowledgement of the importance of using Complex System Science (CSS) by conservation biologists, its application for understanding nest webs is just emerging. We assess the properties of nest webs (heterogeneity, hierarchy, memory, adaptation, and non-linearity) as CAS using situated exemplars from cavity-nesting communities across temperate, sub-tropical, and tropical forests of the Americas (Chile, Canada, Argentina, Ecuador). Although our nest webs have independent evolutionary histories, structures, and disturbance patterns, they share the main properties of CAS. We show that applying CSS in this context has implications for the usage of new, but also conventional conservation management concepts and practices. Understanding nest webs as CAS will facilitate our ability to view how forest-dwelling cavity nesters self-organize and adapt in the face of rapid changes occurring in forests of the Americas.

CHYTRID FUNGUS IN BRAZILIAN ANURANS: USING DUAL RNA-SEQ TO CHARACTERIZE THE DISEASE INTERFACE

Cait McDonald, Cornell University; C. Guillherme Becker, Departamento de Zoologia, I.B., UNESP; Amy Ellison, Cardiff University; Célio Haddad, Departamento de Zoologia, I.B., UNESP; Felipe Toledo, Instituto de Biologia (IB), Unicamp; Kelly Zamudio, Ecol & Evol Biol

Batrachochytrium dendrobatidis (Bd), a major cause of global amphibian declines, is an extreme generalist fungal pathogen capable of exploiting more than 500 species. Virulence and pathogenicity of Bd varies among isolates, and within the Bd phylogeny there is deep ancestral divergence. Amphibian hosts display a similarly wide range in response to disease, varying from extreme susceptibility to complete resistance. Characterizing the interplay between Bd invasion and host response in vivo allows us to understand pathogenesis, virulence, and immunity as highly dynamic processes. Here we characterize the interplay of pathogen and host at the disease interface via laser-capture microdissection and dual RNAseq. In our factorial design, we demonstrate host-pathogen interactions between susceptible and resistant Brazilian amphibian hosts, and Bd isolates of varying virulence. This study is pertinent not only to our understanding of the Bd-amphibian system, but it also has management implications in an era wherein globalization has been implicated as a means by which virulent pathogen lineages may gain access to previously naïve host populations. Moreover, our results highlight the importance of informing captive breeding-based conservation programs with functional genomics data.

CITES TO THE RESCUE? THE EFFECTIVE USE OF CONSERVATION TOOLS TO SAVE CHAMBERED NAUTILUSES

Gregory Barord, Central Campus

Nautiluses represent the last extant species of a 500 million-year-old lineage that has survived every mass extinction event to date. However, a mere 50 years of unregulated fisheries and trade have resulted in population declines across the range of nautiluses. Through collaborative, interdisciplinary research expeditions, the true extent of the decline in nautiluses was recently quantified. Not only were declining catch rates evident in historically fished populations but other populations, without known fisheries, had also declined over a 30-year period. In addition, all populations of nautiluses surveyed were surprisingly small and vulnerable to over-fishing and potential climate change impacts. As a result, effective conservation initiatives could be proposed and undertaken for the first time. In 2016, nautiluses (Family Nautilidae) were adopted into Appendix II of the Convention on International Trade in Endangered Species (CITES). The listing requires countries to provide non-detrimental findings (NDFs) showing that export of the species does not affect wild populations. However, there are no standard methods for how countries determine the NDFs. Often, a consequence of increased regulation is illegal trade. Simply placing a species on CITES does

not guarantee its survival, as countless examples show. Thus, it is paramount that all stakeholders involved in the successful CITES proposal continue to expand on work already done. In reality, the success of CITES might be better gauged by how long a species remains on CITES. As education, awareness, and management plans improve, thereby increasing populations, a species would no longer meet the requirements for CITES and should be de-listed, resulting in a success! The road to de-list nautiluses starts now.

CITIZEN SCIENCE IN FLOWER FLIES OF CHILE: FROM DISTRIBUTION TO KEY COMPONENT OF THE BIODIVERSITY

Rodrigo Barahona Segovia, Universidad de Chile; Alberto Alaniz, Magíster en Áreas Silvestres y Conservación, U de Chile, CFT Medio Ambiente IDMA; Matias Barceló, Universidad de Chile; Gabriela Carrasco-Oliva, Moscas Florícolas de Chile; Laura Pañinao, Universidad de Concepción; Pamela Riera, Universidad de Chile; Pamela Sánchez, Moscas Florícolas de Chile; Cecilia Smith-Ramírez, Universidad de Los Lagos, Instituto de Ecología y Biodiversidad, U. Austral

Citizen science projects (CCP) is a powerful tool that incorporate the citizens in projects of conservation biology, reduce the Wallacean shortfall and increase the knowledge about the biodiversity. Moscas Florícolas de Chile is a CCP that have as aim reduce gaps in distribution, promote the ecosystem roles and update the information about hoverflies. We utilized a simple protocol using social media as data platform, promoting the feedback and motivation of the volunteers. We asked only three data: specific location, date of photographic record and flower visited by flies. In two years, we had > 2000 records from different species and > 1400 citizen volunteers. In distribution, we showed for first time the distribution in Chile of two exotic hoverflies: *Eupeodes americanus* and *Eristalinus taeniops*; two new species recorded for the country and several species of flies that have increased significantly their distribution. Modeling niche with data obtained through CCP predicts that exotic *Eristalis tenax* could be an invasive species and endemic hoverfly *Aneriophora aureorufa* have lost 75% of their habitat. Interaction between hoverflies and flower was mapped for all country identifying four hotspots of this relationship. We compared the visit of flies published in the scientist literature with the CCP visit reported and we found statistical differences ($F(1,156) = 24,88$; $p< 0,0001$). In policy actions, nine species are incorporated to national red list of endangered species under IUCN criteria (one critically, one endangered and seven vulnerable). In social actions, volunteers think that our CCP is a project that needs simple records to collaborate and that the flower flies have an important role in the ecosystem. We discuss the benefits of CCP in the distribution and key role of flower flies as well as the limits in the taxonomical accessibility, funding, disconnection between scientist and citizens or resistance of colleagues.

CLIMATE CHANGE AND MARINE TURTLE CONSERVATION IN YUCATAN´S PENINSULA, MEXICO

Marissel Frias, Pronatura Peninsula de Yucatan

Marine turtle populations around the world are under pressure due to a variety of threats influencing their life cycle. Climate change has been identified as an imminent threat because it affects their populations in different ways and at different levels. In the Yucatan Peninsula, an important area that harbors multiple marine turtle species and critical marine turtle habitat, efforts to understand the effect of climate change on these creatures are focused on monitoring thermic ranges inside nests and on nesting beaches. This is relevant for marine turtle populations as they show Temperature Dependent Sex-Determination (TSD). Therefore, higher sand temperatures may lead to female biased sex ratios. We found that the thermic ranges in the Yucatan Peninsula tend to be below the normal ranges of other tropical nesting beaches in the world; however, this trend does not necessarily occur within the nests. Additionally, we recently incorporated the study of beach profiles on the nesting sites, in order to determine crucial changes in the availability of area for the nesting activity as a direct cause of sea level rise. This is accomplished by measuring contour lines that represent the beach profiles of each nesting area. We have identified seasonal changes in the space availability, but few differences among years. Furthermore, we are now able to recognize areas susceptible to floods. All these efforts and implemented methodologies are unique in Mexico. Though funding is the main limiting factor of the monitoring program, our aim is that our results will lay the foundation for establishing effective management strategies against climate change in a short period of time for marine turtles and their entire habitat.

CLIMATE WATCH AND SPOONBILL WATCH: ENGAGING COMMUNITIES IN CLIMATE SCIENCE AND BIRD CONSERVATION

Nicole Michel, National Audubon Society; Richard Baker, Pelican Island Audubon Society; Brooke Bateman, National Audubon Society; Elizabeth Bergstrom, National Audubon Society; David Cox, Pelican Island Audubon Society; Graham Cox, Pelican Island Audubon Society; Kathy

Dale, National Audubon Society; Caitlin Jensen, National Audubon Society; Gary Langham, National Audubon Society; Geoff LeBaron, National Audubon Society; William Loftus, Pelican Island Audubon Society; John Rowden, National Audubon Society; Zachary Slavin, National Audubon Society; Lynsy Smithson-Stanley, National Audubon Society; Chad Wilsey, National Audubon Society

Climate change poses serious challenges for conservation scientists and policymakers. Yet with these challenges come equally great opportunities to engage communities of concerned citizens in climate science and conservation. National Audubon Society's 2014 Birds and Climate Change report found that 314 North American bird species could lose over half their breeding or wintering ranges by 2080 due to climate change. Consequently, in 2016 Audubon developed two new crowd-sourced science programs that mobilized existing birding communities (i.e., Audubon Society chapters) in partnership with scientists to evaluate climate change effects on birds, and take action to protect vulnerable populations. Climate Watch expands upon traditional monitoring programs by involving citizen scientists in hypothesis-driven science, testing predictions of climate-driven range expansion in bluebirds and nuthatches developed by National Audubon Society scientists. Spoonbill Watch is a partnership between an Audubon research scientist and the Pelican Island Audubon Society community, in which citizen scientists monitor a Roseate Spoonbill colony recently established in response to changing habitat and climatic conditions. Additionally, Spoonbill Watch participants and leaders have moved beyond monitoring to take action to protect the colony, by working with the Florida Fish and Wildlife Conservation Commission towards getting the site declared as a Critical Wildlife Area and by conducting local outreach and education efforts. We will present overviews, lessons learned, and conservation goals and opportunities achieved during the pilot year of Climate Watch and Spoonbill Watch. Scientific – community partnerships such as these are essential to confront the threats posed by climate change.

COFFEE, COMMUNITY, AND CONSERVATION: WHY SUSTAINABLE LIVELIHOODS MATTER IN CONSERVATION

Trevor Holbrook, Woodland Park Zoo - Tree Kangaroo Conservation Program

The Tree Kangaroo Conservation Program (TKCP) works with the remote communities of Yopno-Uruwa-Som (YUS) in Papua New Guinea (PNG) to protect the endangered Matschie's tree kangaroo and its cloud forest habitat where over 90% of the land is owned by the country's indigenous people. TKCP worked with customary indigenous landowners and the PNG government to create the country's first nationally-protected Conservation Area in 2009. The 187,000-acre YUS Conservation Area protects over 50% of the YUS landscape from coastal reefs to 4,000-meter peaks, serving as a 'wildlife bank' where species reproduce and disperse throughout the landscape creating a sustainable resource for the communities. More than 12,000 people live in 50 villages spread across the YUS landscape, solely dependent upon their local natural resources. To mitigate the threat of human intrusion into the protected area, TKCP's livelihood initiative aims to improve incomes and resilience of the communities. To address community needs for cash income and to strengthen local commitment to conservation, TKCP's YUS Conservation Coffee initiative provides farmers with technical expertise and access to premium international markets for their shade-grown coffee. Since 2011, the farmers have exported 50 tons of coffee for a gross income of over $167,000 to their communities. Recognizing the forest's value and ability to provide for their communities, YUS farmers have committed to conserving their forest for the protection of tree kangaroos and other species. This approach can be successfully replicated in coffee-growing regions throughout the globe. As coffee is primarily grown in the tropics and thrives in shaded, multi-crop plots, it is an ideal crop to support conservation-friendly agricultural livelihoods in biodiverse rainforests. The coffee industry is increasingly receptive to such initiatives, with strong consumer interest in supporting smallholder farmers and sustainability throughout the supply chain.

COLLABORATIVE SCIENCE FOR CONSERVATION OF ANDEAN AMAZON RIVERS

Elizabeth Anderson, Florida International University; Javier Maldonado-Ocampo, Pontificia Universidad Javeriana; Fernando Carvajal-Vallejos, Faunagua Bolivia; Andrea Encalada, Universidad San Francisco de Quito; Max Hidalgo, Universidad Nacional Mayor San Marcos

There is an urgent need to herald the importance of free-flowing rivers to human and ecosystem wellbeing in the Andean Amazon region. Transformations in the landscape—from new infrastructure, deforestation, mining, or climate change—threaten to compromise river ecosystems and the ecosystem services they provide. We present a new platform for regional partnership—Rios Vivos Andinos— that aims to unite scientists, government authorities, conservation practitioners, and riparian human communities in Andean Amazon countries to strengthen enabling conditions for conservation and improved management of free-flowing rivers. In this talk, we discuss ways that Rios Vivos Andinos is pursuing regional

scientific analyses that: (1) quantify cumulative effects of hydropower development on freshwater ecosystems and Andes-Amazon connectivity; (2) examine the effectiveness of existing protected areas and indigenous territories for freshwater biodiversity conservation; and (3) develop systems for classification of rivers and freshwater environments in the Andean Amazon region. Products and approaches from these analyses—combined with existing understanding of freshwater ecosystems and ecosystem services—will be disseminated broadly and used to strengthen regional authorities' capacity for implementing effective freshwater conservation strategies through a new integrative diploma program on Science, Management, and Conservation of Andean Amazon Rivers.

CO-MANAGEMENT WITH INDIGENOUS PEOPLES: OVERCOMING CONFLICT AND ALIGNING INTERESTS

John Goedschalk, Conservation International; Gwendolyn Smith, ATTUNE

Forest conservation has been long troubled by conflicts between traditionally-living indigenous peoples and other, more modern, stakeholders. Often conflict is rooted in the difference between the perceived interests of indigenous peoples and other stakeholders, but also may arise from differences in communication, perception about the human-forest relationship, and ineffective participation in negotiations due to power-disparity. So far, conservationist have tried to overcome this discrepancy by creating collaborative management systems with indigenous peoples. Although co-management seems like a great solution to guide all stakeholders towards a conservation target, in practice only few arrangements have proven successful. Co-management has a greater potential for success when it is approached as a holistic, conflict-embedded system rather than a process for reaching a conservation objective alone. This paper presents a methodology for aligning the interests of different stakeholders during the creation of a co-management system in South Suriname. Using the Model for the Analysis of Potential Conflict in Development (Smith et al. 2014), we demonstrate that timely identification of conflict and corresponding balancing of power made the system preemptive and adaptive, two factors that were crucial in the successful creation of the South Suriname co-management system.

COMMUNITY IMPACTS AND PERCEPTIONS OF CRYPTOPROCTA FEROX AS A LIVESTOCK PREDATOR

Samuel Merson, University of Oxford; Luke Dollar, National Geographic Society; Paul Johnson, University of Oxford; David Macdonald, University of Oxford

Fosa *Cryptoprocta ferox* is Madagascar's largest carnivore, occupying much of the forested landscape. Despite worldwide carnivore reductions, limited research and anecdotes underpin our understanding of fosas' potential for human-conflict. This study provides the first systematic evaluation of fosas' predation of poultry, examining its drivers, temporal and spatial occurrence, enumerating fosas killed, and examining its affect upon Malagasy attitudes. Over 1750 households were interviewed across four regions of Madagascar, encompassing its major forest types (deciduous and rainforest) and its major protected area classifications (National Park, Reserve and unprotected forest). Fosa predation was the third greatest cause (15%) of previous year poultry mortality, with chicken coops ineffective in reducing predation. Predation is significantly more prevalent in western forests during the dry season in the evening. Over half of all interviewees disliked fosas, with their predation of poultry the most commonly stated reason. Generalised Linear Mixed Effect Models (GLMMs) revealed respondents' that had suffered poultry depredation and those with less education were significantly more likely to dislike fosas. Additional GLMMs revealed interviewees that disliked fosas and those that were wealthy were most likely to have killed a fosa. A minimum of thirty fosas was killed in retaliation across our study regions during the interview's previous year. Given fosas' population is in decline, and most of Madagascar's forests are of insufficient size to support sustainable populations, these killings are likely detrimental to vulnerable sub-populations. We suggest that education, and robust coop construction programs may be an effective tool in improving attitudes, reducing predation and subsequently reducing retaliatory killing.

CONSERVATION GENETICS IN DISTURBANCE ECOLOGY: AN AUSTRALIAN RODENT IN A FIRE-PRONE LANDSCAPE

Robyn Shaw, The Australian National University; Sam Banks, The Australian National University; Alex James, The Australian Wildlife Conservancy; Rod Peakall, The Australian National University; Katherine Tuft, Arid Recovery

Environmental disturbance is an intrinsic component of ecological communities worldwide, driving patterns of spatial and temporal heterogeneity. Disturbance has

been recognised as playing a crucial role in maintaining ecological communities; however, its role in shaping genetic diversity is not well understood. This knowledge is becoming increasingly important for conservation management, as changes to the climate, landscape and vegetation are rapidly altering disturbance regimes worldwide and genetic analyses have the potential to improve our understanding of the effects of these changes on natural populations. The Kimberley region of Western Australia is a landscape that is characterised by environmental disturbance. In particular, fire (both prescribed-burning and wildfire) is a defining feature of this region. We investigate the role fire plays in shaping genetic diversity in a species of native rodent, the pale field-rat (*Rattus tunneyi*) across the central Kimberly region. We collected genotypes, habitat variables and detailed fire history over a three-year period and used genetic analyses to determine the drivers of population recovery after fire, identify refugia and source populations, and to investigate the degree of connectivity and barriers to dispersal across this landscape. We explore whether population genetic summary statistics can inform our understanding of patterns of movement and population history in fire-affected landscapes. This new framework for applying genetics to disturbance ecology will be integral for guiding conservation management in a world where disturbance regimes are rapidly changing.

CONSERVATION IN MEXICO: STRATEGIES FOR PUBLIC PARTICIPATION IN A WEAK ENFORCEMENT ENVIRONMENT

Cassie Hoffman, Conservation X Labs

The Nevado de Colima Volcano National Park and an adjacent state park in Western Mexico is a small but ecologically important park system, home to one of the most threatened ecosystem's in Mexico: cloud forest. The park system faces common conservation and park administration challenges: limited state funding, roaming cattle, pine beetle infestation, fire risk, illegal hunting and logging, and human settlement. The Park staff have documented, to an extent, some of the illicit hunting and logging activities via camera traps, observation, and data collection in affected areas, but it has been difficult to receive an adequate legal response from Mexican authorities, much less enforcement support (manpower or additional financial resources). This question of resource exploitation by the local populations is of particular concern, where the federal government is pushing the productivity of its forests for economic development as well as the recent downgrade of the Nevado de Toluca protected area from a National Park to a flora and fauna protected area by the Peña Nieto administration to allow "sustainable harvest" activities. We conducted a representative household survey (n=350) in Ciudad Guzmán, a city 15 km from the Nevado de Colima, who benefits from the ecosystem services and the microclimate provided by the Park, and where large quantities of avocado and berries are grown for export. The survey explored the opinions and attitudes about the National Park and water services in the city and sources of trusted information of the inhabitants of Ciudad Guzmán. The survey data was analyzed to determine how the citizens of Guzmán valued the Nevado de Colima National Park, if they connected the conservation of the Park's forest with the ecosystem services and microclimate it provided, and what channels existed for improving communication and the importance of the Park with the local population.

CONSERVATION MANAGEMENT PLAN FOR GUSTAVIA SPECIOSA (LECYTHIDECEAE) IN THE CAUCA RIVER VALLEY COLOMBIA

Nhora Helena Ospina, Universidad de Valle; Yisveire Fontal, Pontificia Universidad Javeriana

Most timber tree species in the tropics are under serious conservation threats, due to uncontrolled, illegal harvesting and trafficking, as well as landscape transformation and climate change. In this study we aimed to evaluate the conservation status of the timber tree species, Gustavia speciosa, in the family Lecythidaceae, in the biogeographic region of the Cauca River Valley, Colombia. In Colombia this species is found in sub-andean forests between 900 masl and 2400 masl. Only 9.6% of this ecosystem type remains in the country due to expansion of both urban and agricultural land use. We conducted a Population Viability Analysis (PVA) on known populations; developed a distribution model using MAXENT; and established the DNA Barcode of Life for the species. Populations evaluated are undergoing a reduction in size, with low juvenile survival. The species distribution was heavily influenced by the variable of average humidity. We found a very low presence of protected areas across the distribution of G. speciosa. DNA Barcode data for the loci matK, rbcL and trnH-psbA were collected and deposited in the database BOLD. Our findings highlight the vulnerable status of G. speciosa populations in Colombia, and permit the construction of a management and conservation plan for this species, as well as providing molecular tools for the control of illegal trafficking of this species.

CONSERVATION OF CHILEAN ANDEAN FORESTS AND ITS FLORA: CONTRIBUTION OF BOSQUE PEHUÉN PARK

Daniela Mellado, Universidad Austral de Chile; Ivan Diaz, Universidad Austral de Chile; Javier Godoy, Universidad Austral de Chile; Ricardo Moreno, University of Gottingen; Gabriel Ortega, Universidad Austral de Chile

Protected wilderness areas are the main tool for the conservation of biodiversity in the world. In Chile there are few areas with detailed inventories of the biodiversity they harbor and the historical use of the lands they protect. This information is essential for zoning areas, defining threats and for developing integrated conservation programs in the long term. The objective of this work was to document the floristic richness and history of use of the Bosque Pehuén Park, a private protected area located within the Araucarias Biosphere Reserve, in southern Chile (39° S). The park is dominated by secondary forests after intensive exploitation in the 1970's and remnants of ancient forests. We sampled 15 points of 150 m of radio regularly distributed in space. At each point, all the vascular plant species were recorded. We found 97 species, with 79% of endemism and 13 species classified under some conservation category. We also found seven invasive plants. The larger richness was found in riparian areas. Total richness is high when compared to other similar works in much more extensive areas, and the method used allow us to estimate the effectiveness of the sampling, giving a better characterization of the flora present in this park. These methods can be replicated in other protected areas to generate information on species richness and distribution that contributes to the conservation of biodiversity in the long term.

CONSERVATION OF COLOMBIAN DRAGONFLIES AND ITS SUITABILITY AS A TOOL FOR AQUATIC PROTECTION

Jenilee Montes, Universidad del Atlantico, Universidad Central de Venezuela

The needs to create sustainability perspectives from a new development model directed to aquatic ecosystems, is making a broad and scientific social movement in the conservation of this resource. Colombia is one of the richest countries in the world in this resource. It has very basic level in the study for water conservation. Dragonflies are often one of the groups most used to monitor the general biodiversity of aquatic habitats. These insects are considered an easy group to study and useful because they spend their larval stages in them and use an extensive range of terrestrial habitats in their adult state. The relationship between these insects and the characteristics of microhabitats shows their usefulness as a tool to monitor these environments over time for their diagnosis and monitoring. Some alterations can be associated with the presence or absence of species, as well changes in densities and population structure. This work presented the preliminary results of the project entitled: Protocol for the monitoring of populations of dragonflies for purposes in conservation of aquatic environments, and the proposal titled: Comparative study of the diversity of dragonflies associated to environments impacted by artisanal mining for sensitize native families in Chocó, Colombia. The results showed that stenotopic species could be used for monitoring aquatic environments. Also flag species were recognized which can be charismatic for educational programs and easy to work in the field. This work also evidences an affective relation of the native people with this group of insects and the usefulness of the dragonflies in conservation studies being easy to identify in the field and to be economically accessible in their field work.

CONSERVATION OF CORAL REEF ECOSYSTEMS OF THE SOUTHEASTERN DOMINICAN REPUBLIC

Camilo Cortés Useche, FUNDEMAR - CINVESTAV

Coral reefs are one of the most important and complex natural ecosystems due to their productivity and biodiversity. Their important functions include the generation of food sources, medical products and coastal protection. They also offer income to millions of people that live along the coastline. In recent decades they have been being degraded and an alarming rate. Given the situation, conservation schemes have been put forth in the southeastern Dominican Republic, among which the creation of Marine Protected Areas (MPAs), restoration of corals (*Acropora Cervicornis*), the control of invasive species (*Pterois volitans*), as well as the analysis of reef condition to identify local stress factors that have an influence on the structure and function of the ecosystem. All of these are associated with the participation of the local community and marine science researchers. The results include the maintenance of 8 coral nurseries (more than 50 structures with a capacity of 30 coral fragments) with 1800 meters of grown coral. To date, 400 meters of coral have been transplanted onto the reefs of Bayahibe. Moreover, there have been 4 lion fish tournaments capturing more than 2,000 individual fish. The findings suggest that locally managed MPAs can be a useful tool not only for the maintenance of rich fish population but also for coral cover.

CONSERVATION OF MAMMALS ON PRIVATE AND COMMUNITY PROTECTED AREAS IN CENTRAL WESTERN COLOMBIA

Maria Bedoya-Duran, SNRE, Dept Wildlife Ecology & Conservation, University of Florida

A strong consensus is emerging that national systems of protected areas are insufficient to conserve biodiversity, and private protected areas are being promoted as an innovative and widespread solution to address this deficit. However, the degree to which private protected areas conserve biodiversity, reduce fragmentation, and improve connectivity is largely unknown. In Serranía de los Paraguas located at the intersection of the Choco and western Andes in Colombia, private conservation efforts have resulted a network of 60 private reserves comprising small -medium forest fragments in an agricultural landscape. In this context, understanding impacts of fragmentation and habitat loss is key for biodiversity conservation. In some fragmented ecosystems, species occur in a nested pattern, i.e., species present in areas of low richness are a sample of the species present in areas with greater richness. Nestedness is important in design of reserve systems to conserve biodiversity and for predicting occurrence of threatened and endangered species in fragmented habitats. Based on data from a camera trapping study, we determined whether the assemblage of medium to large mammals in the study area reserves exhibited a nested pattern. We then 1) identified characteristics of the landscape and reserves linked to this pattern, and 2) examined the relationship between species characteristics and the order in which species are nested. We found that mammals presented a significant nested pattern, and ranking of reserves by nestedness showed a positive relationship with area of the reserve and a negative relationship with reserve isolation. Additionally, species traits like body mass were correlated with the order in which species are nested, suggesting that large mammals in the region are vulnerable under the current landscape structure. Therefore, conservation strategies should target increasing the size and connectivity of protected areas to conserve mammal diversity in the region.

CONSERVATION STATUS IN A DATA VACUUM: RED-LISTING THE ENDEMISM HOTSPOT OF SÃO TOMÉ AND PRÍNCIPE

Ricardo de Lima, Ce3C - Centre for Ecology, Evolution and Environmental Change, Lisbon University

The IUCN Red List offers standards to assess conservation status, but their application is constrained by missing information. Located in the Atlantic coast of central Africa, the Democratic Republic of São Tomé and Príncipe is a small but endemic-rich island nation. Data on most endemics is scarce, making it difficult to create a red list. Frequent taxonomic changes pose a baseline challenge. Terrestrial vertebrates are the best studied taxa. However, since 1994, the list of endemic vertebrates has more 14 species (30% increase) and the number of single-island vertebrate endemics has grown from 29 to 51. More vertebrate populations are known to be distinct species, but await formal description. The number of endemic plants is approaching 150 species, despite obvious persisting taxonomic faults. Revision of groups, such as butterflies, land snails, fungus and geoplanids, often reveal new endemic species and the need for further taxonomic work. Only birds, mammals and amphibians have had all their species assessed. Among the endemics, three amphibians, two mammals and 11 birds are considered threatened, totaling seven vulnerable species, five endangered and four critically endangered. One endemic vertebrate is data deficient, and 19 (32%) have never been assessed. Only 35 (26%) endemic plants have been assessed, including 2 endangered and 24 vulnerable taxa. In other terrestrial taxa, only a few species have been classified, including the critically endangered dragonfly *Trithemis nigra*. Birds are the best-known taxa in the country, still ornithological studies in the last decade have changed or suggested changes to the Red List categorization of ten (36%) endemics. This case study highlights how classifications based on scarce information can undermine the usefulness of the Red List to identify priorities, and urges for the need to associate a measurement of uncertainty to Red List categories.

CONSERVATION STATUS OF THE ANDEAN BEAR, TREMARCTOS ORNATUS, AT THE CHINGAZA NATIONAL NATURAL PARK

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The Chingaza National Natural Park (PNNChi), located in the eastern Colombian mountain range, contributes with the conservation of 766 Km² "Andean forests and paramo" that are Andean bear shelters. Around the Park there are inadequate farming practices that have contributed to the fragmentation and loss of their habitat, increasing the conflict bear-people, giving as a result hunting of the specie. In 2010, PNNChi and WCS joined efforts to begin with a monitoring program which allowed to find out the status and trends of the bear, based on models of occupation. During this year at the western region of the park, 75 transects of 1800m each were

visited, in search of direct and indirect presence of the bear. This activity was repeated in 2014. Using models of a single season we determined an increase in occupation (Ψin four years (estimated from Ψ= 0.79 (S.E. 0.11, detectability = 0.59) until Ψ=1.0 (S.E. <0.01, detectability= 0.99), being this a significant difference (Test of Wald Z=1.9) between those two periods. This could be due to the increase of the bear population by births in the whole massif or the migration of bears from outside to inside the protected area, due to the increase of pressures around the park. Since 2011 the PNNChi has trap cameras that helps on identifying 36 individuals in the western region, including the registration of numerous females with cubs, as well as bears eating carrion. PNNChi has implemented actions to reduce the presence of threats to the bear, such as the presence of cattle and feral dogs. Currently, inter-agency partnerships are being made that will allow us to know the state of the bear and its threats in the massif, an area of 1116,67 Km², to determine conservation actions based on adaptive management.

CONSERVATION THROUGH USE: USE AND POPULATION STRUCTURE OF MAURITIA FLEXUOSA IN TWO ECOSYSTEMS

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Mauritia flexuosa is a key species in lowland Amazon and Llanos savanna ecosystems, and it covers extensive areas and provides a myriad of resources for its inhabitants. We studied ethnobotanical and population structure aspects from *M. flexuosa* in lowland Amazon and Llanos savanna ecosystems with the main objective of providing clues about the conservation status of this specie and to assess the impacts of resource extraction. The ethnobotany of the species was learnt with the communities' inhabitants using semi-structured interviews and participant observation. At the same time, we established thirteen plots with different types of management in Llanos savanna: seven plots (0.28 ha total) in Puerto Carreño (Vichada, Colombia – no use), six plots (0.6 ha total) in Puerto Gaitán (Meta, Colombia – 0.3 ha with high use). In the Amazon, we evaluated two sites Pacaya-Samiria National Reserve (Loreto, Peru – high use) and Amacayacu (Amazonas, Colombia – low use), for both areas we placed 4 plots (0.8 ha total). The general trend showed "reverse J" shape structures in the populations, with a high proportion of seedlings and lower proportion of adults. However, the populations intensively used for its leaves fiber (Puerto Gaitán) and its fruits (Pacaya-Samira), there was a low seedling density. The sex ratio was significantly different than 1:1 in populations used for fruits due to selective extraction of female individuals. The density of individuals was variable among sites ranging from 57 to 457 adults/ha. The sites were density was higher (pure stands) and destructive harvest was banned could allow high resources use and the maintenance of Mauritia flexuosa forests. It has been showed that valued forests by communities are better conserved than those unoccupied or unvalued.

CONSERVING THE ENDANGERED SILVERY BROWN TAMARIN IN HIGHLY DEGRADED FORESTS DUE TO CATTLE RANCHING

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Primates and their habitats have been strongly affected by human activities in most tropical ecosystems. Activities such as hunting, selective logging, and cattle ranching, among others, have lead to the deforestation and fragmentation of primate habitat. Habitat fragmentation leads to a reduction of total habitat area and an increase in isolation between patches of forest, which further reduces the connectivity between patches and impedes the dispersal of individuals from one population to another. Although deforestation and fragmentation of habitat are considered the main threats to primate survival, more research is needed to explore the viability of primate populations in anthropogenically modified landscapes. In this study, we examine the effect of habitat degradation on the abundance and ranging patterns of the silvery brown tamarin (*Saguinus leucopus*), an endangered and endemic primate of Colombia, to evaluate the viability of its populations in degraded habitats. We collected data regarding differences between population densities, home range and habitat use of tamarin groups inhabiting degraded forests within a heterogenous human modified matrix in the state of Caldas. We found that degraded forests have a higher population density than more conserved forests. Moreover, tamarins in degraded forests spent more time resting than feeding and traveled long daily distances per area of forest available, which might reflect the fact that they are constrained by space and are forced to reutilize certain areas of their home range. Although habitats disturbed by anthropogenic activities may have a lower diversity and availability of feeding resources, fruit was the main dietary component in tamarin diets suggesting that these forests are still a suitable habitat for *S. leucopus*. Tamarins display ecological flexibility as well as changes in spatial use of the forest

which may allow them to live in unusually small and degraded forest fragments, at least temporarily.

CONSERVING THE ENDANGERED SILVERY-BROWN TAMARIN THROUGH COMMUNITY INVOLVEMENT

Gianna Florez Ariza, Conservacion Titi Gris Colombia; Lina Valencia, University of Texas, Austin

The silvery brown tamarin (*Saguinus leucopus*) is an endemic primate of Colombia classified as Endangered due to the severe reduction of its populations in the last 3 decades. The species does not occur in any protected area and its remnant populations are distributed in areas of intensive colonization and forest loss affected mainly by cattle ranching and agriculture. "Conservacion Titi Gris" is a research and conservation project aimed at conserving the silvery-brown tamarin in highly degraded forests through community involvement. We designed an environmental education curriculum to increase the understanding of local stakeholders about the threats and degree of endemicity of the species and its role in the ecosystem and in the community's livelihoods. We conducted preliminary surveys to understand the community's perception of tamarins and its habitats and identify what the community feels they have at stake and thus the values that underlie and motivate their behaviors. Based on this, we developed six environmental workshops and used outreach materials to raise awareness of the importance of tamarin conservation for the community's subsistence and to build pride and a sense of identity for tamarins, a primate only found in their backyards. Our post-workshop interviews revealed that there was a shift in behavior and the community increased their understanding of the importance of tamarin conservation to tourism and thus their income. As a result, the community has already started planning primate watching river tours and is using the tamarin as a symbol of the region. Successful conservation programs require a true understanding of the societal context in which people live out their everyday lives, and the social, economic and environmental conditions that lead to their behaviors. Their decisions, actions, and practices are a result of how they perceive what is on their best interest given their background, values, and situation.

CONTRIBUTION OF AGRICULTURAL AREAS TO THE CONSERVATION OF NEOTROPICAL PRIMATES

Maria Molina, Pontificia Universidad Javeriana

There is a gap on the inclusion of productive and economic activities in spatial conservation prioritization studies, limiting the success of biodiversity protection by not considering cost-efficient conservation actions. This research aims to identify the potential of agricultural areas for complementing the conservation of the 133-primate species distributed in the Neotropical region. Species distributions were delimited using species range maps and the species habitats spatialized trough land cover. We calculate land rent based on information of net production value, production quantity, and yield for 209 crops at municipality level for the 20 countries involving the study area. We estimated the habitat suitability of the species weighting the closest areas to the known distribution of species and those habitats where species can inhabit, forage, or use to move. The potential agricultural areas improving primate conservation were determined based on cost-benefit relationship. Those areas, where the opportunity cost of agricultural activities was fewer than habitat suitability, were selected. Results show that most suitable habitats for species are distributed in mature, and non-intervened forests in lowlands of the Andes, Pacific, and Amazonia regions. However, habitat suitability for primates is limited by some deforestation hotspots on central Mexico, northern Andes, northern Amazon, the Cerrado region in Brazil, and large-scale crops like soy in Argentina and Bolivia. Potential agricultural areas with higher values for conservation were found in coffee plantations in northern Mexico, Sothern Brazil, and in Colombian Andes. Conversely, oil palm plantations in Peru and some agricultural areas in western Mexico had the lowest potential due to higher land rents. Some of the identified areas may be easily considered in conservation plans since they are close to protected areas, where their management can have greater benefits.

CONTRIBUTION OF PARROTFISHES TO CORAL REEF RESILIENCE

Trigal Velásquez Rodríguez, Universidad de los Andes; Juan A. Sánchez, Universidad de los Andes

The parrotfishes (Labridae) are considered the dominant herbivores in the Caribbean reefs. Among their ecological functions, corallivory represents a highly specialized role in coral reef fishes foraging strategies. During corallivory, parrotfishes ingest coral fragments that pass through the digestive tract and are transformed in fine sediment. One interesting issue about parrotfishes corallivory is the release of zooxanthellae (*Symbiodinium spp*.) in their faeces. As a consequence, this group is considered to be important as environmental reservoirs and dispersors of zooxanthellae in coral reefs. This research seeks to estimate the viability of *Symbiodinium spp*. dispersed by *Sparisoma viride* (the biggest excavator in the Colombian Caribbean reefs) and to evaluate the capacity of Symbiodinium spp. isolated

from S. viride faeces to establish symbiosis with an aposymbiotic (without zooxanthellae) cnidarian model. The study area is the Archipelago of San Andres, Old Providence and Santa Catalina (Southwestern Caribbean), part of the Seaflower Biosphere Reserve. The methods include SCUBA sampling and the trypan blue assay for the quantification of the live and dead cells dispersed. In the other hand, the infection experiment requires the isolation of *Symbiodinium spp*. in cellular cultures from *S. viride* faeces, the molecular identification of culture´s clades and the development of an aposymbiotic model. As a result, it will be possible to conclude about the ecological role of *S. viride* as dispersers of zooxanthellae (similar to rainforest seeders) and its relevance in the promotion of coral reef resilience under the current and future climate change effects (coral disease and bleaching). Our purpose is to provide globally new ecological arguments about parrotfishes to natives, stakeholders and conservation biologists. Specifically, our main concern in the study area is the current parrotfishes overfishing problem resulting of their status as an open-access resource.

COST EFFECTIVE ACTIONS TO MITIGATE LAND-BASED SOURCES OF POLLUTION IN WEST MAUI THROUGH DECISION MO

Megan Barnes, University of Hawaii at Manoa; Kirsten Oleson, UH Manoa

It is clear that a cocktail of land-based sources of pollution presents serious threats to coral reef ecosystems, and addressing these has become a key management and policy challenge in Hawaii, US and territories, and globally, yet causes of coral reef decline are complex, and establishing direct causal links between deleterious inputs, events, or actions, and these declines, is challenging. Use a decision science approach, we identified a suite of actions and policy measures to ensure healthy coral reefs that support livelihoods in West Maui. We present the results of decision models that combine biophysical models of sediment, and nutrient models in West Maui, management alternatives that incorporate feasibility and pragmatic constraints collaboratively developed with stakeholders, and the relative costs and benefits of these scenarios, as well as a cost-effectiveness tradeoff analysis. Through embedding decision science into stakeholder processes, we have already helped to support strategy decisions, grant applications, and spatial locations for new projects.

CUTEREBRIASIS IN FREE RANGING MARMOSA ROBINSONI IN BARRANQUILLA, COLOMBIA – PRELIMINARY RESULTS

Henrique Guimarães Riva, Fundacion Botanica y Zoologica de Barranquilla; Eduardo Andrade, Independent researcher; Mónica Franco, Fundación Botánica y Zoológica de Barranquilla; Lina Henao, Fundación Botánica y Zoológica de Barranquilla; Christian Olaciregui, Fundación Botánica y Zoológica de Barranquilla

The tropical dry forest is one of the most threatened ecosystems in the world and is the habitat of the Robinson's Mouse Opossum (*Marmosa robinsoni*), a small marsupial within the Didelphidae family. The aim of this study was to describe the prevalence of Cuterebriasis in free ranging *M. robinsoni* in Barranquilla, Colombia. The animals were captured in a small forest fragment in close contact with the city using Sherman traps for five days. The individuals were weighed and anesthetized (20 mg/kg of ketamine HCl and 3 mg/kg of xylazine HCl). A clinical exam was performed and ectoparasites, fecal and blood samples were collected. 9 males and 2 females were captured and classified by weight as 2 adults and 9 juveniles. Yohimbine HCl (0,125 mg/kg) was administered before release. In total, 27% (3/11) of the animals had fly larvae identified as cuterebrid bot fly (*Cuterebra sp*.) extracted from wounds. All three animals had wounds at the scapular region and parasites (from 1.3 to 2.2 cm) were found in hosts weighing from 35 to 80 grams. No significant changes were identified in health condition. This is compatible with literature, reporting little effect on population dynamics of typical hosts, despite prevalence commonly ranging from 30% to 70%. Cuterebrids were described in other marsupials and in M. mitis, however, this is the first report of cuterebriasis in *M. robinsoni*. More data is necessary to determine that *M. robinsoni* is a typical host for *Cuterebra sp*.

DANGERS OF REDUCED NEST DENSITY IN MOBBING BIRDS

Liam Bailey, Australian National University

Mobbing birds cooperate to chase away potential predators. As bird density increases, greater vigilance and mobbing effectiveness may help reduce nest loss. If populations decline, however, predation rates may increase as densities drop, yet this possibility can be overlooked in population projections. We investigated density dependent nest predation in a declining population of the mobbing Eurasian oystercatcher (*Haematopus ostralegus*). 100 artificial nests were placed across a range of *H. ostralegus* nest densities. Predation rate of artificial nests was reduced in high density areas, suggesting that

H. ostralegus will benefit from high density nesting. Further analysis confirmed this effect in real nests. As nest density is strongly correlated with population size in this species, we predict that nest predation will increase as populations decline, potentially accelerating population declines further. This raises the possibility of an Allee effect in mobbing birds. Mobbing is common in a number of shorebird species, many of which are facing population declines. Therefore, conservation work with shorebirds and other mobbing species should consider the importance of nest density as a driver of nest predation and reproductive success.

DETECTING GENETIC DIVERGENCE IN A RELICT NEW ZEALAND SEABIRD

Aisling Rayne, University of Canterbury; Karen Baird, Forest & Bird; Chris Gaskin, Northern New Zealand Seabird Trust; Stefanie Ismar, University of Auckland; Mark Miller, James Cook University; Tammy Steeves, University of Canterbury

The inclusion of a conservation genomic approach promises to be indispensable for detecting adaptive and non-adaptive genetic divergence, particularly for relatively poorly studied species with divergent phenotypes. We are using genotyping-by-sequencing (GBS) data to determine whether 'summer' and 'winter' breeding populations of New Zealand's threatened Kermadec petrel (*Pterodroma neglecta neglecta*) represent genetically divergent lineages. The Kermadec Island group, approximately 1,000 km northeast of New Zealand, currently hosts over 10,000 breeding pairs of Kermadec petrel in which two divergent breeding behaviours are represented. Most are 'winter' breeders (laying February-April), however a small number 'summer' breeders (approximately 250 breeding pairs, laying October-November) have been identified on the Meyer Islands, 4 km from Raoul Island (the largest of the Kermadec Island group). These 'summer' breeders represent the last survivors of a great population once hosted by Raoul Island that was effectively extirpated during the mid-20th century through predation. Raoul Island became predator-free in 2004 and later expeditions have confirmed that 'winter breeders' have recolonised the island, while 'summer' breeders remain absent. Preliminary genetic evidence based on a small number of known 'winter' (n=22) and 'summer' (n=6) breeders indicates no shared mitochondrial cytochrome oxidase 1 haplotypes. Should our genomic data, which will represent both putatively adaptive and non-adaptive variation, indicate that 'winter' and 'summer' breeders are indeed genetically distinct, conservation action for 'summer' breeders will be warranted - particularly if this is further supported by non-genomic data. To this end, our findings will form the foundation of a larger interdisciplinary collaboration investigating the genetic, ecological and behavioural distinctiveness of Kermadec petrels across the Indo-Pacific.

DETERMINANTS FOR CROP RAIDING BY WILDLIFE SPECIES IN AFRICA AND ASIA

Eva Gross, Awely; Oliver Jakoby, RIFCON GmbH; Bibhuti Lahkar, Awely; Laly Lichtenfeld, African People & Wildlife Fund; Vincent Nyirenda, Copperbelt University; Naresh Subedi, NTNC

Wildlife species feeding on crops can cause substantial losses to farmers and at the same time create negative attitudes against wildlife and conservation resulting in the rise of human-wildlife conflicts (HWC). For the analysis of conflicts between humans and terrestrial wildlife species, a globally applicable scheme for monitoring was developed and applied in two Asian (Nepal and India) and two African (Zambia and Tanzania) study areas over six years. Findings on crops damaged by wild herbivores are described for eight groups of wildlife species. Determinants for crop raiding by different herbivores were analyzed using generalized linear models. Contrary to general assumptions, the nutritional stress due to lack of forage in the natural habitat was not triggering crop raiding behavior, but rather the availability of crops on farms. Further, the growth stage of crops played a major role for the frequency of crop damages according to species. Crop raiders such as elephants (*Loxodonta africana* and *Elephas maximus*), zebra (*Equus burchelli*) and Suidae (*Sus scrofa, Potamocherus larvatus* and *Phacochoerus africanus*) showed preferences for harvested and/or maturing crops. Rhinoceros (*Rhinoceros unicornis*) and Pecora (*Taurotragus oryx, Aepyceros melampus, Boselaphus tragocamelus* and *Axis axis*) caused the highest numbers of crop damages on fields with crops in intermediate growth stage. Large and megaherbivores showed a preference to feed on staple crops (maize, rice, and wheat). The findings of this study have a high importance to the management of HWCs in areas where people and wildlife coexist. This study further demonstrates the benefits of standardized HWC assessments in order to compare data from different continents and between different species to be able to draw generalized conclusions for the management of HWCs. We therefore propose strategic and comparable HWC assessment by wildlife management and conservation agencies or other responsible authorities.

DEVELOPING AND SUSTAINING A REGIONAL CONSERVATION EDUCATION PROGRAM

Martin Main, University of Florida; Shelly Johnson, University of Florida

Educating and motivating the public to understand, support and participate in conservation efforts and education is becoming increasingly important, especially at regional scales. Challenges associated with developing, implementing, evaluating, and providing continued financial support for regional programs that reach large audiences are substantial. This presentation details strategies that have proven successful for the Florida Master Naturalist Program (FMNP), a statewide conservation education program that includes multiple courses offered by a network of more than 150 professional educators representing dozens of organizations and 75 training teams throughout Florida. The FMNP is curriculum-based and includes 3 core courses (Coastal, Freshwater, and Uplands Systems) and 4 courses on special topics. All courses include classroom and experiential learning. The FMNP curriculum is supported by educational materials, program evaluation tools, and a fee-based structure that makes the program self-sustaining. During 2001-16, the FMNP issued 12,900 course certificates to 7006 persons, 1,966 of which have completed all 3 core courses. FMNP training is designed to educate and empower to educate others. FMNP training promotes volunteerism, is valuable for professional development with graduates obtaining jobs and advancements, benefits teachers who take knowledge into the classroom, and for the countless opportunities to share knowledge with friends and family. The objectives of this presentation are to share FMNP strategies that will be useful for individuals and organizations interested in developing regional conservation education programs and to provide evidence of the programmatic success of the FMNP as obtained through evaluative procedures. Additional information about the FMNP is available at www.MasterNaturalist.org.

DEVELOPING GENERAL RULES TO ADDRESS COMPLEX CONSERVATION PROBLEMS USING SIMPLE DICHOTOMIES

Vanessa Adams, University of Queensland; Alienor Chauvenet, University of Queensland; Caitlin Kuempel, University of Queensland; Hugh Possingham, The University of Queensland

All conservation decisions have advantages and disadvantages which ultimately affect outcomes delivered by conservation actions as a whole. The many variables and uncertainties in ecological systems can make these choices challenging. Thinking in terms of dichotomies can help to simplify and define concepts, concentrate on the issues at stake, and ultimately determine a solution; for example, complex conservation problems can be framed as simple decisions between two choices, e.g., monitor or manage, move species or not. This offers a unique perspective that helps to simplify complex problems and determine solutions. Assessing costs and benefits of alternative actions is an essential component of conservation planning and meeting desired objectives. We use novel methods and strategic case studies to assess trade-offs in conservation strategies to determine if complex decisions can be simplified to broadly applicable guidelines, and which actions produce the greatest benefits under a constrained budget. In particular, we address the question of when to increase investment in protection or management (ranging from threat abatement through to ecosystem restoration). We present simple rules to aid policy makers and managers in saving money and achieving greater outcomes for biodiversity.

DIET AND TRADITIONAL KNOWLEDGE DETERMINANT FOR CONSERVATION OF SPIZAETUS ISIDORI IN COLOMBIA

Juan Restrepo, Pontificia Universidad Javeriana

The Black-and-chestnut Eagle (*Spizaetus isidori*) is distributed throughout the Andes from northeastern Colombia to northern Argentina. It is considered to be forest dependent and highly sensitive to anthropogenic disturbances. In Colombia, it is estimated that it has lost 60.6% of its habitat and is heavily subject to hunting pressure being that feeds domestic fowl (*Gallus gallus*), so that is categorized as endangered. Between 2010 and 2016 the eagle diet was compared by analyzing the relative frequency of prey and the biomass consumed in three Andean landscapes of Colombia. We also compared traditional knowledge about *S. isidori* among adult men and women, as well as the perception of *G. gallus* predation and eagle acceptance levels in four Andean rural communities that share habitat with the species. Significant differences were found in the consumption of prey in relation to the location of nests in natural landscapes or in the border of the agricultural frontier and the native forest, through the breadth indices and dietary overlap; suggesting that the type and proportion of prey would be related to a higher frequency of interaction between rural communities and eagle habitats, and therefore with landscape composition. It was also determined how perceptions and attitudes of different actors would be considered as a threat to this species, so that any initiative to protect *S. isidori* should then integrate the gender approach and involve research of knowledge and attitudes of local actors. On the other hand, a complete and updated analysis was carried out regarding diet and traditional knowledge of *S. isidori* in Colombia, which will be useful for the development of conservation strategies of this species.

DIFFERENCES IN HABITAT AND RESOURCE USE BY MAMMALS IN THE ATLANTIC FOREST HOTSPOT, BRAZIL

Marcelo Magioli, University of São Paulo; Katia Ferraz, University of São Paulo; Marcelo Moreira, University of São Paulo, CENA

Habitat loss and fragmentation cause negative effects on mammals, changing resource and habitat use patterns, and even trophic structuration. The Brazilian Atlantic Forest is widely affected by these processes, and knowledge on how mammals thrive in modified landscapes is essential to improve conservation actions. Here we present evidence of changes in habitat and resource use, and trophic structuration of mammals between preserved and modified landscapes in the Atlantic Forest. Using C and N stable isotopes, we obtained information on resource and habitat use (C3 and C4 resources), and trophic structuration (15N enrichment), by analyzing hair samples of mammals, and comparing landscapes with different forest cover. Hair samples were obtained by fecal samples collection and hair traps. For comparison, we divided species in feeding guilds: herbivores, frugivores, omnivores, insectivores and carnivores. For all feeding guilds in preserved areas, resource use consisted mainly of C3 resources (forest remnants items), while in modified areas, guilds had a predominant mixed (C3/C4) and C4 diets (agricultural matrix items), with a wide range of C values, except for insectivores. Trophic structuration was more evident in preserved areas, with 15N enrichment increasing from herbivores to carnivores. In modified areas, the structuration was not clear, with wide variation in N values for all guilds (except for insectivores), e.g., some herbivores had a 15N enrichment similar to top predators, indicating the consumption of N enriched items. However, in preserved areas, individuals of sensitive species, *Tapirus terrestris* and *Tayassu pecari*, showed a mixed diet and high 15N enrichment, indicating consumption of food items in surrounding areas. The information presented is novel, especially for modified areas, which have knowledge gaps on species ecology, allowing to propose new approaches for species conservation and landscape management. Financial Support: FAPESP #2014/10192-7.

DIFFERENCES IN SPATIAL CONSERVATION PRIORITIZATION: A MULTICRITERIA ANALYSIS IN THE NEOTROPICS

Jaime Burbano-Girón, Pontificia Universidad Javeriana

The purpose of spatial conservation prioritization is to identify a network of conservation areas under three basic criteria: representation, persistence, and cost-efficiency. Exercises using all three criteria are scarce, but they have shown differences in networks of conservation areas identified when different combinations of them are applied. These differences could result in allocating efforts, resources, and actions on regions where success in protecting biodiversity is highly uncertain. Thus, we compare the differences in priority areas identified under the three basic criteria of spatial conservation prioritization for the most biodiverse region globally, the Neotropics. We employed the geographic distribution, habitat, and ecological function of 9008 species of amphibians, birds, mammals, and reptiles. We modeled land use changes for the Neotropical region to evaluate most vulnerable areas, and the dispersal distance of species to determine their potential population viability. Finally, to estimate opportunity costs of agricultural and livestock activities, we recovered the data of rent, production, and yield for 209 crops and cattle at municipality level for the 20 countries involving the study area. We employed Marxan to generate networks of conservation areas. Differences were compared at three levels: similarity, mean differences, and level of association. Results show larger differences among conservation areas when the cost-efficiency criterion is included, followed by persistence, and representation. However, when the three criteria are employed simultaneously, the most robust networks are identified, due to lower variability with respect to those using only one criterion. Our results show a comprehensive representation of biodiversity, and globally may be one of the most complete, since it includes a significant fraction of known biodiversity, at the species level, and within the Neotropical taxa of the groups included.

DIFFERENTIAL PREFERENCE OF AN INSULAR FLYING FOX FOR SEED FIGS OF A DIOECIOUS SPECIES

Shiang-Fan Chen, Center for General Education, National Taipei University, Taiwan

Multispecies mutualistic interactions form complex networks of interdependence and are considered primary factors in the generation and maintenance of biodiversity. Pteropodid bats are keystone species that provide important ecosystem services of pollination and seed dispersal in the tropics and subtropics. In this study, we investigated the availability and utilization of food resources by the insular frugivorous flying fox, *Pteropus dasymallus*, to evaluate the ecological role of this species. Fig species constituted the major portion of the diet of this species. When foraging, the flying fox prefers seed figs from female trees to gall figs from male trees in dioecious fig species. Germination experiments showed that most of the fig seeds in the feces were viable; furthermore, the seeds exhibited a significantly higher percentage of

germination than those from pellets and ripe figs. Our results also report deliberate insectivorous by *P. dasymallus*, including the consumption of large beetles. We suggest that the abundance of female dioecious figs accurately represents food availability. This differential preference in feeding behavior involving the active selection of functionally dioecious seed figs or viable seeds can effectively prevent a negative impact on the survival of pollinating wasps. This feeding behavior might reinforce the evolution of dioecism in figs. In addition, the effects of gut passage on seed germination, in combination with their capacity to travel long distances, may substantially facilitate the efficiency of flying foxes as seed dispersers.

DISTRIBUTION AND CONSERVATION OF MAMMAL FUNCTIONAL DIVERSITY AT MULTIPLE SCALES IN THE NEOTROPICS

José González-Maya, ProCAT Colombia, Sierra to Sea Costa Rica

Mammals are one of the key groups in the functioning of ecosystems, and yet one of the most threatened. Loss of mammal populations and consequent functional loss can potentially represent a major threat to global ecosystem Ψ functioning and therefore stability. The aim of this work was to evaluate patterns of functional diversity (FD) at different scales, its spatial variation and main determinants at Neotropical and national levels, as well as its relationship with human intervention and species at risk. We found that mammal FD patterns are naturally influenced by species richness and ecological scale, but intervention and threatened species are currently determining factors at regional scales. For most Neotropical ecoregions, human intervention and species at risk are the most important drivers, where certain ecoregions have already suffered drastic FD loss and others are more likely to suffer it due to extinction on the short term. Nationally, for Costa Rica and Colombia, FD differs from species richness and is strongly influenced by composition, environmental, biogeographic and anthropogenic determinants, also showing spatial mismatch with other diversity measures (i.e., richness and phylogenetic diversity), likely indicating areas of unique species composition. Regional variation and convergence can be the response to environmental filtering as well as extraordinary trait convergence in assembling communities according to ecosystem type. Our results have implications for conservation prioritization and planning, the differential impact of human intervention and the need to explore the spatial variation of the species-ecosystem relationship and its potential determinants. Functional diversity should be a measure considered in future conservation priorities´ definition schemes, allowing better resolution for resource allocation and decision-making.

DRAGGIN' THEIR FEET: DELAYED EMERGENCE AND DISPERSAL INFLUENCE DRAGONFLY POPULATION STRUCTURE

Payton Phillips, Central Michigan University; Brad Swanson, Central Michigan University

Despite acting as indicators of habitat and water quality, dragonflies are an understudied taxon. Nymph and adult dragonflies live in drastically different habitats, necessitating the conservation of both aquatic and terrestrial environments for dragonfly populations; however, little is understood about the connections between nymph and adult stages, especially in areas with multiple, connected subpopulations. We sampled 97 nymphs and 149 adult White-faced Meadowhawk (*Sympetrum obtrusum*) from five locations in Southwest Michigan over two summers. We performed AFLP genetic analysis and used the Bayesian analysis program STRUCTURE to detect genetic clusters from sampled individuals. STRUCTURE detected k=4 populations, in which nymphs and adults from the same locations did not necessarily fall into the same groups. These results suggest that some dragonflies disperse from their natal area, while others remain. In addition, nymphs collected in the same location in different years often fell into different genetic clusters, suggesting that dragonflies remain in their nymph stage for multiple years, with different populations emerging in alternating years. These results are further supported by Fst results among populations (0.070-0.231 in pairwise comparisons). Several conservation implications arise from our results. First, both dispersal and temporal cycling of nymph emergence are important in structuring dragonfly populations and need to be considered in conservation plans for dragonflies. Second, the multiple generations of nymphs found within in each location may lessen the effect of stochastic events impacting breeding adults. Given that some individuals from a cohort will have remained in the nymph stage and will later emerge as adults, the genetic loss resulting from stochastic events may decline. Lastly, it suggests that dragonflies exist as a metapopulation with dispersal occurring over a distance of at least several kilometers.

DRIVERS IN CONSUMER PREFERENCES AND SUSTAINABLE WILD MARKET POTENTIAL FOR DISCUS TRADE (SYMPHYSODON)

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The freshwater sector of the ornamental fish trade is a highly profitable global industry that can, if managed

effectively, provide economic benefits, contribution to natural resource conservation and poverty alleviation through sustainable wild harvests, and diversion of interests through aquaculture. It is thus of great importance to identify trade suitable species with potential for sustainable management and adaptability between practices, as well as ensure a valid continuation of the wild market to prevent local returns to deleterious practices. Discus of genus Symphysodon expressed high potential being among the top Amazonian fish in highest demand within the ornamental trade, with unique and diverse market interests for both wild and cultured varieties, and minimal observable impacts to populations. However, as the species is data deficient in conservation status and limited in market information, we conducted choice experiments to obtain an understanding on consumer preferences and drivers behind existing demand for discus. Latent class modelling was applied to provide insights on heterogeneity between broad market regions and end-user groups within the associated ornamental fish community, with particular emphasis on market potential for wild types. Results saw demand split between a largely international cultivated market, and a substantially smaller wild market predominantly restricted to traditional consumer regions. Strongest favours for wild discus were among young, working male discus keepers with specialist background from European regions. Particular interest was placed among Far East Asian consumers with interests for cultivated wild types, revealing potential for targeted promotions for sustainable sources with wild purchases within sectors. This reflects the first market study on the discus trade, and addresses recommendations for further assessments to ensure trade suitability and potential for sustainable management.

DRIVERS OF RISK AND MITIGATION STRATEGIES CHANGE AT DIFFERENT LEVELS OF SOCIO-ECONOMIC DEVELOPMENT

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We studied the perceived drivers of water-related risks, as well as risk and vulnerability reduction strategies in three basins located in Mexico, Laos and Finland by using participatory workshops and policy document analysis. All cases showed a multidimensionality of risk drivers and risk reduction strategies inherent in complex systems where factors such as culture, economic strategies, population growth, governance, policy-making, history and environmental factors are needed to understand risk and to propose risk reduction measures. We observed how drivers and strategies which were shared among all cases, evolved as socio-economic development shifts from low (Laos) to high (Finland). Drivers of risk such as agriculture production, urbanization, land use change, and infrastructure development, ranged from expanding (Laos) to intensifying use (Finland). Other drivers such as economic strategy revealed a path of expanding primary sector (Laos), poor monitoring of primary sector in Mexico (both considered negative) to tuning the monitoring for primary sector in Finland (considered as positive). Some of the strategies to reduce risk and vulnerability expressed a similar pattern. New legislation was proposed in Laos, while in Mexico, the focus was on enforcement and improvement of existing regulations, in Finland, a more holistic approach for legislation was suggested. Conservation was also a shared strategy; in Laos, safeguards to access key resources was recommended, in Mexico, the rehabilitation of natural environments was the focus, and in Finland management for conservation was central to the strategy. Most of the suggested risk and vulnerability reduction strategies could be considered as incremental adjustments, although many of the drivers regarded as important were large-scale trends which could require more transformative strategies. This suggests a scale mismatch between drivers and strategies, an issue that was also observed when analysing policy documents.

ECOLOGICAL RESTORATION OF WILDLIFE: IMPLICATIONS IN THE CONSERVATION OF BIODIVERSITY

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Latin American is a wildlife refuge; however, species of fauna and flora are threatened by lost habit to supply services for the growing human population. The speed of change of land use has required the implementation of strategies to favour the recovery of natural ecosystems through ecological restoration (ER). It is now about the potential of ER for the recovery of forest cover and plant structure; however, the wildlife restoration has not been equally documented. In order to understand the strategies of ER and their consequences on wildlife recovery and conservation, we synthesized the available information to Latin America, focused on Colombia. We carried out a selective search in databases such as Scopus, ISI web of Science, Google Scholar, Science Direct and Scielo. In addition, we requested specific information to regional environment authorities (Corporaciones Autonomas Regionales). Prelaminar results suggest that restoration of wildlife is not a common practice into the RE projects. By

the other way, when the wildlife is included as restoration object, the most common practice is the habit supplier, or habit recovery. Another important topic, that is a trend in the information reviewed, is the scarce of monitoring strategies which make to impossible to evaluate the actions successful and the implications to wildlife conservation. It was negligible the information about if habitat restoration could be facilitates an ecological trap and then, the implication to wildlife non altered population.

ECOSYSTEM ENGINEERING BY FASCICULARIA BICOLOR IN THE SOUTH AMERICAN TEMPERATE RAINFOREST

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Ecosystem engineers are organisms that modify habitats and resource flows, they therefore could have a disproportionate impact on the diversity of ecological communities. Evidence suggests that trash basket epiphytes (TBE) can be considered ecosystem engineers of forest canopies, due to their relationship with arboreal soil availability and treetop communities. Here we evaluated whether the TBE Fascicularia bicolor (Bromeliaceae), modulates temperature and humidity in the forest canopy of the South American temperate rainforest (SATR), in Chile. We also investigated if this bromeliad is related to greater arboreal soil accumulation and is associated to higher diversity of other epiphytic plants and invertebrates in the canopy of the SATR. We measured temperature and humidity in ten trees within the forest before and after the experimental addition of *F. bicolor*. We also related the presence of *F. bicolor* with occurrence of soil macro-fauna and other canopy dwelling plants in a comparative field survey. Temperature variability in the canopy was reduced by *F. bicolor.* Soil availability was higher in sites with mats of F. bicolor. The richness of vascular epiphytes was unaltered by the presence of *F. bicolor*, but species composition differed between sites with and without mats on each tree. At the group level, the cover of lichens and bryophytes was greater in sites without *F. bicolor*, while vascular epiphytes show a larger cover in sites with *F. bicolor*. The species richness of invertebrates increased in treetop sites colonized by *F. bicolor* but species composition was not different from soil in branch bifurcations. Our results show that *F. Bicolor* must be considered in forest management practices to determine which trees must be logged, in order to preserve the viability of populations of these key organisms in the treetops of South-American temperate rainforests.

ECOSYSTEM RESPONSE TO SALMON FARMING IMPACT IN A CHILEAN FJORD

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Aquaculture could generate significant ecosystem degradation due to the alteration of biogeochemical cycles, mainly nitrogen. These can cause a drastic change in the ecology of the ecosystem, with potential environmental catastrophes, which may have implications for the ecosystem, animal and public health. In this study, the effect of salmon culture on ammonium concentration and microbial communities associated with the nitrification process were explored at the Comau Fjord, Chile. Our results suggest that Comau Fjord NH4+ enrichment events occur associated with salmon production and also naturally from river inputs. However, salmon farming nutrient enrichment increased 1000% when high salmon density production was observed. Higher presence of ammonium oxidizing bacteria (AOB), archaea (AOA) and nitrite oxidizing bacteria (*Nitrospina-spp*. like) were detected in subsurface layers which is coincident with lower ammonium concentrations. Our findings suggest a possible change on nitrifying communities caused by salmon farm ammonium enrichment in the Comau fjord, and potentially different fates of this enrichment in summer compared with wintertime. On the other hand, mesocosms experiments results indicate that Chilean bacterial community is sensitive to ammonium enrichment and incubation days, causing a decrease in richness, diversity and community composition. These results asseverate that Comau fjords is not able to process large amounts of nutrients from the raft cages with high densities of salmon production. Therefore, the fjord microbiome should be consider in order to determine thresholds to mitigate aquaculture nitrogen enrichment effects.

EDGE EFFECT ON LICHEN'S DISTRIBUTION AND CHLOROPHYLL CONTENT, IN FRAGMENTS OF POLYLEPIS QUADRIJUGA

Carolina Ramos, Universidad Pedagógica y Tecnológica de Colombia, Grupo de Investigación en Manejo integrado de ecosistemas y Biodiversidad; Karen Pulido Herrera, Grupo de Investigacion en Manejo Integrado de Ecosistemas y Biodiversidad

The edge effect is a phenomenon associated to ecosystems fragmentation that leads to conservation of natural biotic and abiotic traits only in the interior of fragments. Lichens are organisms especially susceptible to environmental variability, what could be useful for bio-indication of edge effect. In this work, we evaluated the edge effect in two fragments of *Polylepis quadrijuga* in the Páramo de la Rusia (Colombia) for finding changes on distribution of lichens associated to *P. quadrijuga* and their chlorophyll content. We used three transects of 70 m across the matrix-edge-interior gradient in each fragment. We chose nine phorophytes per transect to measure the environmental variables: radiation, relative humidity and air temperature, and the biological variables: richness and cover per species. Besides, we employed the species that were present in all the three zones of the gradient to quantify the content of chlorophylls a and b, and determine if there are alterations in the ratio of chlorophylls a/b that could suggest physiological plasticity as a response to edge effect. Our results showed that fragment 2 had a higher edge exposition because of its high relation perimeter/area, allowing to an environmental homogenization and lose of biodiversity in relation with fragment 1. Overall, we found 55 differentially distributed species in relation with the fragments and the matrix-edge-interior gradient. The interior of fragment 1 was the most conserved zone, harboring unique species in 40 % of its composition. Six species of wide distribution showed changes in the chlorophyll content along the matrix-edge-interior gradient, what is an evidence of physiological plasticity to edge effect. It was also possible to distinguish species with preference to warmer environment and species with preference to humid and sufficiently irradiated places. We concluded that some species of lichens could have an important potential as bio-indicators of fragmentation in the páramo.

EFFECTS OF ENVIRONMENTAL POLLUTION ON AMPHIBIANS: PERSPECTIVES IN BIODIVERSITY CONSERVATION

Sylvia Rojas, Universidad Andres Bello

One of the direct causes of biodiversity loss is the environmental pollution resulting from the use of chemicals. Different kind of chemicals like persistent organic pollutants and some heavy metals, are endocrine disruptors which act at low doses for a long period of time, having a negative effect on the reproductive and thyroid system in vertebrates worldwide. Due to their widespread use and their negative effect, it has been developed measures to protect human and ecosystem health including the use of bioindicatores to assess the environmental pollution. But the research of the effects of endocrine disruptors and the use of bioindicatores in neotropical ecosystems where the pressure on biodiversity are scarce. This is the case of Chile, where these kinds of chemicals were detected at different concentrations in the environment of some ecosystems, but only few studies have been done of the biological effects that these compounds may have in some organisms. This study proposed Xenopus laevis (African claw frog), an introduced species, for its possible use as a bioindicator of endocrine disruptors in aquatic systems in the Mediterranean hotspot in central Chile. For this purpose, gross body indices, histological index and systemic alterations in animals from areas with different degrees of contamination were determined. We observed alterations that could be linked to endocrine disruptors present in the environment. This study points out the effects that endocrine disruptors may have for the wildlife conservation and the need to assess and monitor such effects throughout time.

EFFECTS OF LAND-USE HISTORY AND FIRE PATTERNS ON KAZAKHSTAN'S STEPPE BIRDS

Ingrid Stirnemann, Institute of Landscape Ecology, University of Munster

The Eurasian steppes stretch from Ukraine to the Altai Mountains. Despite widespread conversion to cropland, very large areas of grassland in a near-natural state remain, especially in Kazakhstan. The Kazakh steppes harbor important populations of endemic and globally threatened steppe birds, such as the Pallid Harrier, the Steppe Eagle, and the Black Lark. The Kazakh steppes have been the scene of massive land-use changes, e.g., the abandonment of millions of hectares of cropland, and the collapse in grazing livestock numbers due to the break-up of the Soviet Union in 1991 and associated changes in wild fires patterns. This decline in anthropogenic activities led to the recovery of many steppe bird populations. However, both recent and further proposed expansion and intensification of agriculture the region indicate that the development of strategies that reconcile food production and biodiversity conservation are urgently needed. Here, we used a large-scale field study to investigate how Eurasian bird species richness, presence and abundance respond to changes in land-use and fire frequency in the temperate steppe grasslands of northern Kazakhstan. Our findings demonstrate how past anthropogenic effects, such as changes in land use, can have long term consequences on birds decades after an event. For example, we found that abandoned arable fields can influence the presence and abundance of some common steppe birds more than 20 years after arable fields have been abandoned. We found that historic fire patterns also influenced the abundance and presence of some of the most common steppe bird

species. Our findings highlight the different effects that legacies of past land-use and fire disturbance have on bird species composition and abundance in steppe grasslands. In our talk, we will discuss our findings in the light of potential future land-use changes, and discuss how this can be used to improve conservation management.

EFFECTS OF ORGANIC FARMING AND LANDSCAPE ON BIODIVERSITY OF RICE FIELDS IN JAPAN

Yosihiro Natuhara, Graduate School of Environmental Studies, Nagoya University

Rice fields have been playing an important role as wetland habitat for plants, water birds, frogs, fishes and aquatic invertebrates. More than 5,000 species have been recorded in and around paddy fields in Japan. Traditional rice fields were subdivided into small plots and had relatively large levee areas. Small irrigation ponds were dug in some areas where precipitation was low. Levees provided semi-natural strips of grassland, while ponds were home to many aquatic animals and plants. But these traditional paddies required significant labor, and it is hard to find paddy fields today without improvements that increase paddy size to allow large tractors, rice planting machines, combine harvesters, and engineered subsurface drainage control systems in each field. Coincident with paddy-plot expansion, the number of irrigation ponds decreased from 300,000 in 1950s to 210,000 in 1997. Biodiversity in rice fields has decreased due to both modernization and abandonment of rice fields. Organic farming and farming with reduced pesticide are promoted by the government to reduce environmental load by agriculture. However, evidence that biodiversity is promoted by those farming than conventional farming is scarce in rice fields. We present data on aquatic animals in rice fields with organic, reduced pesticide and conventional farming in Shiga Prefecture, Japan. Sampling of aquatic animals was conducted at 23 fields between June and August 2009, a period between mid-season drainage and the final drainage using, and at 26 fields between May and July, a flooding period. Aquatic animals were sampled in 0.4 m2 by using a 1-mm mesh D-frame dip net (20 cm width) at 20 points in each rice field. Animals collected were sorted and identified to the finest taxonomic level. The collected samples were 127 taxonomic groups and 31,494 individuals in 2009, and 128 and 47,690 in 2010.

EFFECTS OF SHIFTING WILDFIRE REGIMES ON MAMMAL CONNECTIVITY DYNAMICS IN A TRANSBOUNDARY WILDERNESS

Patrick Burke, University of British Columbia

Climate disruption is anticipated to reduce global biodiversity in the 21st century through habitat loss, extinctions, changes in community dynamics, and shifts in species distributions. In the North Cascades Ecosystem, large, high-severity fires are closely linked to climate warming and predictive models suggest that novel disturbance regimes will develop from increased fire activity. Improving landscape connectivity is a frequently cited climate mitigation strategy, but current applications portray connectivity as a static process. Understanding the mechanisms that contribute to connectivity change over time (connectivity dynamics) is vital for predicting climate response for organisms. Our research evaluates connectivity dynamics for multiple mammal species in a protected area network with an active wildfire regime using simulations parameterized by empirical data. This poster presents preliminary findings from the first year of study in a transboundary protected area along the border between the United States and Canada. Camera traps were deployed at 46 sites using a probabilistic sampling design. We estimated the probability of site occupancy for each species based on environmental conditions at the patch level and then used circuit theory to predict species landscape connectivity across the study region. We calculated the change in network connectivity between a static connectivity scenario and multiple dynamic connectivity scenarios representing potential future wildfire conditions. We are currently exploring opportunities to use dynamic connectivity metrics in population persistence models to evaluate long-term viability for impacted populations.

EFFECTS OF THREE PESTICIDES IN CRYING-FROG (PHYSALAEMUS GRACILIS, ANURA: LEPTODACTYLIDAE) TADPOLES

Marilia Hartmann, Federal University of Fronteira Sul; Paulo Hartmann, Federal University of Fronteira Sul; Paola Sturza, Federal University of Fronteira Sul; Guilherme Vanzetto, Federal University of Fronteira Sul

The impact of pesticides in environment is of special concern in amphibians, which are declining globally. However, the role of pesticides in this decline is not clear. The goal of this study was to examine tadpole lethality and keratodonts characteristics in crying-frog (*Physalaemus gracilis*) exposed to sub-lethal concentrations of a commercial formulation of atrazine (herbicide), cypermethrin (insecticide) and tebuconazole (fungicide). The three pesticides are commonly used in agriculture in Brazil and *P. gracilis* is a specie that can occurs associated to agroecosystems. The spawns were collected right after oviposition, between October 2015 and March 2016. The spawns were maintained under laboratory

conditions. The chronic test (21 days for atrazine and tebuconazole and 7 days for cypermethrin) was carried out with tadpole of stage 25. Were tested three sub-lethal concentration: 0.5, 1.0 and 4.8 mg/L for atrazine; 0.01, 0.02, 0.03 mg/L for cypermethrin, and 0.01, 0.03, 0.15 mg/L for tebuconazole. Five tadpoles were placed in sterile glass flasks containing 500 ml of the test solutions, in sextuplicates (more negative control), and monitored daily for mortality. Keratodonts characteristics were examined at the end the test. The mortality showed a concentration-dependent increase (p>.00). The mortality in the chronic test was 21.1 % for atrazine, 82.2% for cypermethrin and 17.7% for tebuconazole. The control did not reach 10%. ANOVA showed a reduced frequency of keratodonts in exposed tadpoles (atrazine p=.018; cypermetrhin and tebuconazole, p>.00). The rows of keratodonts were partially or totally lost. We believe that the sublethal effects of these three pesticides are normally underestimated. The high mortality observed in low concentration of pesticides, if occurs in the environment, may cause the reduction in the amphibians population. Effects in keratodons can limits fitness of nutrition, and consequently decreases the chances of survive of this species.

EFFORTS FOR CONSERVATION OF THE THREATENED SPECIES MYRMECOPHAGA TRIDACTYLA: A MOLECULAR APPROACH

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The species *Myrmecophaga tridactyla* (giant anteater), has been one of the main victims of environmental impacts in several countries, including Brazil, and is listed as "vulnerable" by the International Union for Conservation of Nature (IUCN). Therefore, studies for its conservation are essential. This study aimed to analyze the genetic variability and population structure of this species in a population from the northwest region of the State of São Paulo, in the Atlantic Forest-Cerrado ecotone, using microsatellite molecular markers. In the analyzes, six pairs of specific primers were used and also twenty samples obtained from the forest fragments. The PCR products were visualized and genotiped on 3% high resolution agarose gel and the data analyzed by population statistical softwares. The analyzes indicated the presence of inbreeding at the subpopulation level, revealed by the high Fis value and reinforced by the low heterozygosity observed. The decrease of population size might have led to a higher frequency of mating among related animals, leading the population and subpopulations to present low genetic variability. Our results are reinforced by the data and graphs obtained in different softwares, by the morphological and behavioral characteristics of the species and also by the intense habitat fragmentation. Such events are aggravated because of mortality of individuals and also population size reduction due to recurrent fire events and road-kills recorded in the analyzed area, isolation of the population, expansion of cities and agricultural frontiers. Therefore, the results of the present study propose a local model of analysis in other populations and subpopulations located near the studied area in order to understand the structure of populations in the whole northwest region of São Paulo State. In addition, this data may allow the creation of appropriate management programs for this threatened species.

EMPOWERING THE YOUTH OF LIBERIA TO TACKLE CLIMATE CHANGE THROUGH PROPAGATION OF FUEL EFFICIENT STOVE

Harnon Garbo, Farmers Associated to Conserve the Environment; Mary Molokwu, Fauna & Flora International, Liberia; Gordon Sambola, Society for the Conservation of Nature of Liberia (SCNL); Richard Sambolah, Farmers Associated to COnserve the Conserve the Environment (FACE); Richard Sambolah, Farmers Associated to COnserve the Conserve the Environment (FACE)

The coastal belt of Liberia contains habitat of wide variety of wildlife species. Some common features of this region include mangrove forests, estuaries, lakes and ponds. Small percentage of the area is coastal tropical-highland semi-evergreen forest. The Farmers Associated to Conserve the Environment (FACE) in partnership with Fauna &Flora International (FFI) implemented a project in the Lake Piso MUR. The project aims to reduce deforestation and improve health in North-West Liberia through pilot youth-run scheme to build and distribute fuel-efficient stoves. The project trained 3 females and 7 males between ages 20 and 30 from local communities and established nature clubs in four schools. FACE also identified minimum of 20 communities who desired to develop and engage in the production and use of eco-stoves. Twenty 20 young women and men between ages 18 to 25 were trained in eco-stove production. The eco-stoves were tested and results indicate that the stoves are more efficient than tradition coal-pot stoves made purely of metal plate. Local authorities were overwhelmed and requested mass production to serve low income and poverty-stricken

people in the community. FACE and FFI intend to provide long-term educational support to the nature clubs. The support will include field tour during which there will be lectures on ecological issues relating to climate change, how human actions contribute to climate change and what can be done to reverse or stabilize climate change.

ENDANGERED JACKRABBIT ESTABLISH ITS FEEDING AND RESTING SITES ON PASTURE WITH CATTLE PRESENCE

Arturo Carrillo-Reyes, Universidad de Ciencias y Artes de Chiapas; Alma Luna-Casanova, Facultad de Ciencias Forestales, Universidad Autónoma de Nuevo León; Tamara Rioja-Paradela, Universidad de Ciencias y Artes de Chiapas; Laura Scott-Morales, Universidad Autónoma de Nuevo León

Lepus flavigularis Wagner 1844 (*Tehuantepec jackrabbit*), a species endemic to southern Oaxaca in Mexico, is currently considered as the jackrabbit in greatest danger of extinction worldwide. In the locality of Santa María del Mar in Oaxaca, it inhabits open pastures, sharing habitat with domestic cattle (*Bos taurus*). Understanding interspecific relationships is of great importance to the establishment of appropriate management plans. We record radio-tagged and no radio-tagged jackrabbits that established their resting and feeding sites on pastures with presence and absence of cattle. Compositional analysis of habitat preference was conducted. This paper reports for the first time the preference of *L. flavigularis* to establish feeding (Ψ= 0.8010, P = 0.0020) and resting sites (Ψ= 0.6605, P = 0.016) in the pasture with the presence of cattle. Selection of these sites could be attributed to the fact that the presence of cattle can function as an alarm system against possible predators, while the cattle grazing could itself promote palatable species of Poaceae that form part of the diet of this leporid. This information is key to the establishment of future management plans for both species and their ecosystem.; we recommend the inclusion of domestic cattle always under proper management scheme that takes into account the grazing capacity.

ENVIRONMENTAL EDUCATION AS A CONSERVATION TOOL: THE CASE OF ENDEMIC AMPHIBIANS OF MEHUN CHILE

Aracely Soto Silva, Universidad Austral de Chile; Wara Marcelo, Universidad Austral de Chile

Environmental education is a fundamental tool for biodiversity conservation. Environmental education seeks to promote environmental sensitivity, knowledge formation, attitudes and behaviors favorable to the environment and nature. The establishment of environmental education programs in primary schools can act as a basis on which to construct long-term conservation plans in society. Amphibians are one of the most threatened groups of vertebrates globally, and Chile is not an exception. Particularly, in the town of Mehuín, Southern Chile, inhabit two species of amphibians highly threatened; *Insuetuphrynus acarpicus* and *Eupsophus migueli*. Although the threats to its conservation are multiple, the habitat destruction by inappropriate uses of the territory is one of the most important. In the town of Mehuín, environmental education could represent an important tool to achieve the conservation of amphibians in the long term. In Chile, however, few environmental education programs have focused on amphibians, and there are no studies to assessment the effectiveness of environmental education programs. Therefore, the goal of this work was to evaluate the effectiveness of an environmental education project for the conservation of amphibians in the town of Mehuín. To determine the effectiveness of the project, a comparative analysis was performed between the beginning and the end of the project in two groups of children from primary school; A first group that received environmental education workshops and a second group of children who did not receive environmental education workshops. The results of this study indicate that there are indeed changes in children's knowledge of amphibians after participating in an environmental education project. To a lesser extent, changes in the valuation of amphibians were generated. This study can be used as a basis for future environmental education programs.

EO WILSON BIODIVERSITY LABORATORY IN GORONGOSA NP: A NEXUS FOR CONSERVATION AND COMMUNITY EDUCATION

Piotr Naskrecki, Gorongosa Restoration Project

Gorongosa National Park is a 4,067 km sq protected area, located at the southern end of the Great East African Rift Valley in Mozambique. It is a region of high species diversity and ecological features found nowhere else. The park is home to over 400 species of birds, over 120 species of mammals, and over 100 species of amphibians and reptiles. The 1977-1992 civil war caused tremendous damage to the park, including the loss of over 90% of its large mammals. The Gorongosa Restoration Project, a U.S. not-for-profit organization, has teamed with the Government of Mozambique to restore the ecosystem of Gorongosa, and to develop educational and commercial enterprises that benefit local communities. Since 2006, we have been leading successful, large-scale reconstruction and expansion efforts in the Park, including reintroduction of all its previously dominant mammal species. Recently

we have taken our conservation and education efforts to a new level with the creation of the E.O. Wilson Biodiversity Laboratory. The lab is quickly becoming a hub of scientific and educational activity in Mozambique, training the first generation of Mozambican conservationists and scientists. The lab places strong emphasis on community education and engagement as well as on providing an environment for long- and short-term research for local and visiting researchers. The lab offers advanced workshops and courses in conservation-related fields for Mozambican students, research internships, and grants for independent projects. Its facilities include a molecular laboratory, a biological synoptic collection, a lecture hall, and researcher accommodation. The park is supportive of long-term and experimental approaches to research, and offers a streamlined permitting process. Examples of current research projects include multi-trophic interactions in savanna landscapes, dynamics of the floodplain ecosystem, paleoecology, human-animal conflict, and monitoring of zoonotic disease vectors.

ESPELETIA SPP AS DISTURBANCE AND RECOVERY INDICATOR IN NATIONAL PARKS TRAILS IN COLOMBIA

Cristina Lopez-Gallego, Universidad de Antioquia; Paula A. Morales Morales, Herario Universidad de Antioquia; Robinson Galindo, Parques Nacionales; José González-Maya, ProCAT Colombia, Sierra to Sea Costa Rica; Daniela Ortegon, Universidad Nacional de Colombia; Nathalia Perez, Universidad NAcional de Colombia

In countries with low conservation budgets, tourism becomes an important option to ensure the long-term sustainability of conservation initiatives like protected areas. However, it has an inevitable negative impact on the ecosystem for which, especially in tropical countries, few assessments have been carried to evaluate it. The herbaceous plants are perhaps the ecosystem component in which disturbance can be easily evidenced due to trampling, or by extraction of individuals of charismatic species. National Parks in Colombia are not the exception: in 2016 they received a total of 1'446,716 visitors and there is not currently a standardized methodology to determine the magnitude of the impact caused by the traffic of visitors on trails. In this study, we compared the richness, composition, structure and abundance of plants of Espeletia genus on trails with different use intensity in a Paramo ecosystem in Chingaza National Park. We established three trail treatments: active, inactive and on recovery. On each treatment, two 100m2 plot-transects were established. We determined taxonomic identity and measured height and distance to the center of trail for every individual. We found that species richness was different among trail types while plant height and distance to trails responded significantly to the different kind of trails (K. Wallis, p=2.2e-16, W=0.7784 & p=1.98e-11, W= 0.957). Additionally, we found that trails with 2 years of recovery, showed more similar patterns to inactive than to active trails. Based on these preliminary results, we not only assessed the impact of tourism visitation over a charismatic/representative plant, but also suggest Espeletia richness, structure and composition as a useful and low-cost indicator to determine the disturbance degree of over trails, and as promising tool like support for decision-making regarding load capacity and mitigation strategies in protected areas located in threatened ecosystems such as Paramo in Colombia.

ESTIMATING LOSS AND FRAGMENTATION OF HABITAT OF SCELORCHILUS RUBECULA: REGIONAL TO LOCAL PATTERNS

Alberto Alaniz, Universidad de Chile; Mario Carvajal, Universidad de Chile; Kathryn Sieving, Wildlife Ecol & Conservation; Cecilia Smith-Ramírez, Universidad de Los Lagos, Chile

The habitat loss and fragmentation represent major threats to biodiversity worldwide, mainly to the land use and cover change. The native forest has been seriously affected by these dynamics, threatening all the specialist biodiversity. One of this forest ecosystems is the South American Temperate Rainforest (SATR), considered as a biodiversity hotspot. The aim of our study is to estimate the habitat loss and fragmentation of a focal and endemic species specialist of SATR (*Scelorchilus rubecula*). We present a novel method to estimate the species habitat, combining species distribution models (SDMs) and life story traits of the species, through MaxEnt and Geographic information systems (GIS). We generated a SDM of the species, and then a series of constrains based on life story traits were applied, related to habitat and behavioral requirements. Following, we analyze the historical loss of habitat, and the loss and fragmentation between 2000 and 2014 at regional scale, applying landscape metrics on Fragstats software. Finally, three representative sites were selected to evaluate population dynamics between 2000 and 2014. *S. rubecula* occurs mainly between 36° to 42°S, occupying the Andean and coastal native forest. At regional scale, the historic habitat loss was 46.6%, while between 2000 and 2014 the loss was 3.03%, with clear evidences of habitat fragmentation, especially in coastal zone. All the selected sites were seriously affected by fragmentation and habitat loss, which reduce the number of viable population and change the structure of source and sink populations in the study period. Our approach could be useful as a tool for conservation, improving the prediction of distribution

and habitat of SDM, which allows to conservation biologist and decision makers to evaluate population dynamic in spatially explicit way.

EVALUATING USE OF UNMANNED AERIAL VEHICLES (UAVS) FOR MONITORING FLAMINGOS

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Unmanned aerial vehicles (UAVs) are increasingly being used in wildlife surveys and monitoring. We evaluated the feasibility of using an off-the-shelf, "ready to fly" UAV (DJI Phantom 3 Professional) for surveying flamingos (Phoenicopteridae) in several wetland sites in Argentina where three flamingo species can be found. We found that images obtained by flying the UAV 25 - 30 m above flamingos provided sufficient detail to distinguish different flamingo species and detect the status of nests without disturbing birds. Flamingos were more easily detected when the background habitat was uniform, and the habitat color presented more contrast with the flamingos. UAVs can detect birds that cannot be seen from the ground due to obstructions in the landscape, can provide more accurate numbers for large, densely clustered groups whose dimensions cannot be assessed from the ground, and can provide critical information in situations of difficult access more than a kilometer away, with little disturbance. Shortcomings of the UAVs were mainly related to weather and persistent high winds in our open landscapes. UAV performance was not affected when flown at high altitude (up to 4,500 m.a.s.l.). Our preliminary experience shows that UAVs can provide valuable complementary information to traditional ground-based surveys of flamingos in diverse wetland habitats.

EXAMINING LANDSCAPE COMPOSITION OF AN AGROECOSYSTEM ON HUNTING HABITAT USE OF BARN OWLS (TYTO ALBA)

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Agricultural land conversion has resulted in drastic declines in wildlife habitat quantity and quality and is a threat to biodiversity worldwide. Furthermore, expansion and intensification of agriculture can diminish ecosystem services that benefit humans. Understanding how wildlife can provision ecosystem services on farms may incentivize wildlife conservation in agricultural landscapes, especially in sensitive areas such as the Mediterranean biome. Moderate climates in this biome allow for high concentrations of biodiversity and endemism, but are also ideal for producing world-class wine grapes resulting in habitat loss and degradation. Attracting barn owls (*Tyto alba*) to nest on farms for pest management has been documented in numerous agricultural settings. In Napa Valley, California, viticulturists have littered the landscape with owl nest boxes as part of integrated pest management programs, but their usefulness has not been rigorously examined by ecologists. We deployed GPS loggers on barn owls and used Time Local Convex Hulls (t-LoCoH) to examine foraging habitat use and selection. Barn owls foraged in most habitat types and showed selection for grasslands and oak savannas. Preliminary results demonstrate variable responses by owls to landscape composition in two separate regions of Napa Valley, the south consisting of ~29% vineyard and the northern region consisting of ~66% vineyards. Barn owls' use of vineyards was proportional to the availability of this habitat within their foraging range in the south but not in the north. Examining the spatio-temporal movement patterns of hunting barn owls is essential to understand how habitat composition affects the likelihood of barn owls foraging on vineyards versus surrounding habitats. Furthermore, recognizing this relationship may bolster support for habitat conservation in the Mediterranean biome.

EXPLORING NONCOMPLIANCE WITH FISHERIES RULES IN THE BRAZILIAN PANTANAL

Ethan Shirley, Michigan State University; Meredith Gore, Michigan State University

A stronghold for threatened species, the Pantanal is a conservation priority region for its biodiversity and hydrological importance. Most of the Pantanal is in Brazil, which protects the wetland with a comprehensive set of conservation rules. The Pantanal's intractable mosaic of rivers, forests, swamps, and savannas, as well as its extreme seasonal flooding and lack of infrastructure, render enforcement of these rules difficult. Voluntary compliance is thus critical in the region, and although it theoretically depends on perceived legitimacy of rules, the topic has not been studied in the Pantanal. Efforts to improve compliance are hampered by a lack of understanding of what rule violations look like and factors underlying decisions to not comply. The goal of this research was to establish baseline insights about compliance in the Pantanal by focusing on violations of fishing rules by professional subsistence fishermen, who live on the riverbanks and depend on fish stocks for both food and income. We conducted face-to-face interviews (N=41) in March–September, 2016, with objectives to (1) determine the rate of noncompliance with size limits for the pacu, and (2) characterize the reasons influencing noncompliance. Most (85.4%) violated the rule, and

trust in biologists who define the size limits significantly influenced perceived legitimacy and frequency of violations. Half of the participants distrusted biologists to set the rules, even though 87.8% had never talked to a biologist. This research shows trust in biologists is relevant to the Pantanal's noncompliance rates and sets a baseline upon which future compliance assessments may build. Understanding the nature and scale of noncompliance can help set expectations about intervention impacts, with trust in biologists being one variable that may improve with interventions. Future studies could explore how interactions between locals and biologists influence trust in biologists and conservation rule compliance.

FEELING THE HEAT: THE SUSCEPTIBILITY OF AFRICAN PENGUINS TO HOT WEATHER EVENTS AND CLIMATE CHANGE

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The African Penguin was classified as Endangered by the IUCN in 2010, due to a 70% population loss over a decade. Among many threats, one of the least studied is the risk of breeding failure due to heat stress. Historically, most African Penguins bred in guano burrows, providing a buffered microclimate and shelter from predators. Former guano scraping led to habitat loss, a major issue exacerbating heat stress. Without the protection of a burrow, adults may leave their nests to cool down in the sea. This is often fatal for broods in surface nests due to predation and exposure. Climate change is increasing the frequency and severity of extreme weather, worsening the situation. Previous studies indicate that impacts can be reduced by artificial nests. However, whether they can fully replace natural burrows was not understood. This study sought to determine the temperature where heat stress begins in African Penguins, understand behavioral responses to temperature, evaluate the effectiveness of artificial nests, and investigate how climate change will affect penguins. Laboratory studies showed that penguins' behavioral thermoregulation methods could not cope with a rise in ambient temperature above 28.5°C. This is almost 2°C lower than expected, from similar species, suggesting that African Penguins are particularly sensitive to climate change. Field-based studies using operative temperature models suggested that heat stress may occur more often and at lower air temperatures than anticipated. Artificial nests experienced high temperatures in summer, commonly above penguins' heat stress point. Exposure to sun increased temperature in all artificial nest types, but did not significantly affect natural burrows, suggesting that artificial burrows do not adequately protect penguins from heat stress. The results of this study provide a model to predict how African Penguins may be affected by future climate change, informing management actions to limit impacts on populations.

FINE SCALE GENETIC STRUCTURE IN FOREST ANTELOPES ACROSS OMO-SHASHA-OLUWA FOREST LANDSCAPE NIGERIA

Michelle Fasona, University of Lagos; Andrew Gregory, Bowling Green State University Andrew Gregory, Bowling Green State University; Rosemary Egonmwan, University of Lagos

Conserving species across remaining patches of forest landscape is the key goal for conservationists in Nigeria. Loss of habitat is identified to be one of the driving forces responsible for decline in forest species population in the region. Fine scale genetic structure of wildlife populations are often influenced by composition and configuration of forest landscapes. Genetic structure analysis has not been carried out on species in the study area and this study aims to look at the impact of landscape structure on the genetic structure of two common antelopes in Omo-Shasha-Oluwa Forest Reserves, south-West Nigeria. Genetic information was derived from non-invasive hair samples across the study area landscape was assigned to two geo-referenced antelope species (*Philantomba maxwelii*; N = 70 and *Trangelaphus scriptus*; N = 69) using ten microsatellites. Population structure was identified using STRUCUTRE and GENELAND. Descriptive statistics was determined using GENALEX and wombling analysis and Bayesian clustering using Markov models (WOMBSOFT) for the identification of genetic barriers and tested their significance. Two populations were identified for *Philantomba maxwelii* and three populations were identified for *Trangelaphus scriptus*. Genetic differentiation was found within the *Philantomba maxwelii* and *Trangelaphus scriptus* populations. The Wombling analysis revealed statistically significant barriers for the two antelope species. The results indicate that landscape structure has influence on the genetic structure of both *Philantomba maxwelii* and *Trangelaphus scriptus* populations; although the study suggests that these species are able to disperse through non-forest habitats but there is a need to manage these species under management units according to their genetic structure for effective wildlife conservation in the study area.

FOCAL SPECIES, NEW RECORDS AT THE SIRAP-EJE CAFETERO, ECOREGION COLOMBIA

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The "Eje Cafetero Regional System of Protected Areas" (SIRAP-EC), comprises both slopes of the Central Cordillera, the eastern slope of the Cordillera Occidental and the Cauca -Magdalena rivers valleys of Colombia. The SIRAP-EC has identified six focal species to implement management and conservation plans that include actions such as the identification of new populations in the northeastern section of the system, to reduce biases in the explicit orientation of conservation actions. The aim of this study was to identify new presence localities for five focal species: four bird species (*Leptopsitacca branickii, Hapalopsittaca amazonina, Andigena nigrirostris* and *Andigena hypoglauca*) and one mammal species (*Dinomys branickii*). We build fundamental models for each species based on both ecological aspects and environmental variables of historical presence localities (i.e., ecosystem type, vegetation cover, topography and elevation). The sampling cost-efficiency balance for this study was increased overlying "suitability" areas >75% resulting from fundamental models for all species. Sampling for birds was carried out through ad libitum transects, at different vegetation types through 292 km and 15 localities sampled between 1600-3100 MASL. *D. branickii* sampling was carried out in 21 riparian forests with a sampling effort of 53.1 km. Signals of presence of *D. branikii* were found in seven transects. We identified four focal species at nine new locations. The fundamental model prediction values were variable and highly sensitive to the sampling areas with high potential presence for four species. Our results highlight the value of fundamental models to guide focal species populations search and their cost-efficiency for multi-species study when trained personnel carry out them. Both new and previous records allow to execute more effective conservation actions and to improve the development of more robust ecoregional species distribution models.

FOOD HABITS OF BENGAL TIGERS (PANTHERA TIGRIS TIGRIS) IN CHITWAN NATIONAL PARK, NEPAL

Shivish Bhandari, Tribhuvan University

Understanding the feeding ecology of the tiger (*Panthera tigris tigris*) is one of the key components for long term conservation. We studied entitled food habits of Bengal tigers. The eighty-five tigers' scats were collected and scat analysis was employed. With each scat, 20 hairs were selected randomly for observations of cuticle patterns. There were 109 prey items (n=85) found within the scat samples. Tigers selected eight different taxa and chital (Axis axis) was reported as the major prey species with a frequency of 44.94 % of the tigers' diets. The occurrence of other principal prey species included 22.92 % of sambar (*Cervus unicolor*), 14.65% of wild pig (*Sus scrofa*), 9.16 % of hog deer (*Axis porcinus*), 3.65 % of barking deer (*Muntiacus muntjak*) and 1.82 % of gaur (*Bos gaurus*). Some tigers selected livestock for food and a small component of the relative biomass was consumed from livestock (buffalo at 4.63 % and cow at 1.64%). Presence of livestock in the tigers' diet can be minimized if illegal grazing is avoided in and around the park area and it might be helpful for mitigating human – tiger conflicts and lead to the improvement of tiger conservation.

GENETIC CHARACTERIZATION OF THE AFRICAN JEWELFISH (HEMICHROMIS LETOURNEUXI) INTRODUCED TO FLORIDA

Natalia Belfiore, University of Tampa; Pamela Schofield, United States Geological Survey

The African jewelfish, *Hemichromis letourneuxi*, is an invasive, predatory cichlid that has been introduced at least once, since the 1960s, to Florida (USA). Its native range is in freshwater bodies west of the Red Sea, spanning Egypt, North Sudan, and Eritrea in northeastern Africa, and thus it is likely adapted to a variety of tropical and subtropical habitats. It was first encountered, introduced by unknown means, in the Miami area in the 1960s. In subsequent decades, the fish has been encountered in waterways spreading west and north rapidly within the state of Florida. It is tolerant of a wide range of aquatic conditions, freshwater and brackish, including shallow, vegetated or rocky areas of canals, tidal creeks, culverts, rivers, and marshes. This invasive species is a threat to other aquatic species, including native fishes, shrimp and snails because of its predatory behavior. We use mitochondrial DNA sequence data from the control region (Dloop), from jewelfish sampled in six Florida localities, plus one Mexico population, spread throughout the current range of this introduced species. We build a population tree and hypothesize the historical relationships among jewelfish populations. Results show that nearly all Florida fish populations are intermixed, supporting the idea of one invasion, with one exception. Fish near the Tampa Bay area appear to be distinct and may represent a separate introduction. Mexican fish, previously identified as *Hemichromis guttatus*, appear to be genetically the same species, and closely related to the Florida fish. The next

phase of this research is to develop novel nuclear sequence markers with sufficient within-species variation, to carry out the same analysis, in order to verify the population history, and to expand sampling within the state.

GEOLOCATOR TRACKING OF GREAT REED-WARBLERS IDENTIFIES KEY REGIONS FOR MIGRATORY WETLAND SPECIALISTS

Cagan Sekercioglu, University of Utah; Joshua Horns, University of Utah; Lale Aktay, KuzeyDoga Dernegi; Evan Buechley, University of Utah; Mark Chynoweth, University of Utah; Emrah Coban, KuzeyDoga Dernegi; Mehmet Ali Kirpik, Kafkas University; Yakup Sasmaz, Kafkas Univ Kafkakus Grp

Wetland-dependent migratory songbirds represent one of the most vulnerable groups of birds on the planet, with 67% of wetland-obligate species threatened with extinction. One of the major hurdles for conservation efforts is determining the migration routes, stopover sites, and wintering sites of these species. We describe an annual migration cycle revealed by geolocator tracking of Great Reed-Warblers (*Acrocephalus arundinaceus*) breeding in the Aras River wetlands of eastern Turkey. Because of its relatively large size and breeding ground fidelity, the Great Reed-Warbler is an excellent candidate for geolocator studies and can serve as an indicator species for other wetland songbirds, many of which are particularly threatened in the Middle East. All birds made use of at least 2 wintering grounds in South Sudan, on the Indian Ocean coast and on the western shores of Lake Malawi, as well as several important stopover sites. We also identified a counterclockwise migration path into and out of Africa. Throughout the year, these birds encountered 277 Important Bird Areas, .40% of which had little or no protection. Many species of wetland songbird, particularly threatened species, may be too rare or too small to be the focus of similar studies. Our results not only allow for comparisons with other Great Reed-Warbler populations, but also reveal previously unknown stopover and wintering locations to target conservation efforts that will help wetland-dependent bird species in the Middle East and East Africa.

GLOBAL CORRELATES OF EXTINCTION RISK IN FRESHWATER CRAYFISH

Lucie Bland, The University of Melbourne

Global trait-based analyses can shed light on the factors predisposing species to high extinction risk, and can help bridge knowledge gaps in speciose and poorly-known taxa. In this paper, I conduct the first global comparative study of crayfish extinction risk. I collated data on intrinsic (biology and ecology) and extrinsic (environment and threats) factors for 450 crayfish species assessed on the IUCN Red List. Phylogenetic multiple regression models were used to identify correlates of risk in all species; in centres of diversity (American cambarids and Australian parastacids); and among threat types (agriculture, water management, pollution). I assessed the relative ability of threat maps quantifying specific threats (e.g., river fragmentation, mercury deposition) or a generic threat (human population density) to predict crayfish extinction risk. I also assessed the effect of range size with variation partitioning and multiplicative bivariate regressions. Crayfish with small range size, small body size, habitat dependency on caves, and with ranges in areas of low precipitation, high altitude, and high human population density were at higher risk of extinction. Correlates of risk varied between American cambarids and Australian parastacids, suggesting that centers of diversity shape patterns of extinction risk in crayfish. The explanatory power of models ranged between 31% and 65%, with low explanatory power for models based on threat types. Few specific threat measures were significantly related to extinction risk, questioning the appropriateness of threat mapping in the red listing process. I conclude that extinction risk-promoting factors are likely to differ between vertebrates and invertebrates, and that large-scale threat mapping may be less informative for the latter. Trait-based approaches are both informative and cost-effective, and could make significant contributions to the global conservation of invertebrates.

GLOBAL PROTECTED AREA COVERAGE FOR VERTEBRATE SPECIES VS. INVERTEBRATE AND PLANT ASSEMBLAGES

Moreno Di Marco, CSIRO; Simon Ferrier, CSIRO; Tom Harwood, CSIRO; Andrew Hoskins, CSIRO

Nations are committed to ambitious biodiversity targets set under the Convention on Biological Diversity, with further biodiversity commitments through the broader UN Agenda for Sustainable Development. At the core of these commitments is the goal of reducing global extinction rates. Knowing where species are distributed, and whether they are adequately covered with protected areas, is necessary to measure global progress toward this ambitious goal, and to identify spatial priorities for conservation action. However, with ~2 million species described to date, comprehensive distribution data are only available for a handful of groups, with vertebrates (~3.4% of all described species) being typically used as a broad surrogate of terrestrial biodiversity. While the potential umbrella effect that vertebrates have on a number of other taxonomic groups has been tested

through regional or local case studies, it remains unclear whether vertebrate distributions can be used as global surrogates for assessing the protected area coverage of invertebrate and plant biodiversity. Here we address this question using a recently developed model of spatial variation in the global composition of species assemblages at 1km resolution, based on data for >254,000 species of plants and >133,000 species of invertebrates. We demonstrate that evaluating the representativeness of the global protected area network for ecological assemblages is a powerful way to complement species-level assessments, especially when these are available only for a handful of groups. This readily available approach has great potential to inform a more taxonomically comprehensive assessment of global biodiversity goals.

GOOD ANT, BAD ANT? SOIL ENGINEERING BY ANTS IN THE BRAZILIAN CAATINGA DIFFERS BY SPECIES

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Ants play a crucial role as ecosystem engineers. By building their nests, they modify infiltration and soil moisture patterns, which can in turn strongly influence plant recruitment and distribution. These modifications are particularly important in semiarid environments, where water is a limited resource. In this study, we investigated modifications of soil physical properties by two ant species in the Caatinga, a semiarid region of northeastern Brazil. We assessed infiltration, soil bulk density, and soil texture on (i) 22 active nests of the queenless ants Dinoponera quadriceps, located in a seasonally dry, old-growth forest; and (ii) one active and one abandoned nest of the leaf-cutter ant Atta laevigata, both situated in a degraded pasture. Infiltration around *D. quadriceps* nests was significantly higher than in the other Caatinga soils, and the nests showed significantly lower bulk density and higher clay content. At the pasture site, the abandoned nest of A. laevigata showed three times higher infiltration than the pasture matrix, whereas the annular zones of both nests—areas larger than those covered by the mounds—showed high bulk densities and three times lower infiltration than the pasture matrix. Additionally, both the active and abandoned mounds had significantly coarser texture than the soils of the pasture. In general, our results suggest that these two ant species are playing different roles in the hydrology of their ecosystems. On the one hand, D. quadriceps, a species sensitive to disturbances, facilitates infiltration and modifies soil physical aspects in ways that can benefit woody plants (which were ubiquitous around their nests), thereby possibly increasing forest resilience. On the other hand, A. laevigata, a species that benefits from disturbances, has mixed effects on soil properties and possibly a negative overall impact on infiltration and soil moisture, which can have a detrimental influence on forest recovery.

GOOD GOVERNANCE STRUCTURES FOR INTEGRATING MARINE AND LAND-USE MANAGEMENT

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Land-uses such as agriculture, forestry, mineral extraction, and urban development are widely accepted to have an influence on marine and coastal environments. Chemical and sediment loading of runoff, as a result of these land-uses, has considerable impacts on the health of marine ecosystems, from seagrass meadows, to coral reefs, to ocean trenches. Yet, despite these impacts being widely documented in the scientific literature, a comprehensive literature review of over 100 sources conducted for this research shows there are surprisingly few examples of well-integrated land-use and marine management policy. More often than not, countries and regions have an individual policy for land-use management, and then another for marine management. Our literature review shows many of the stand-alone land-use policies have led to sustainable outcomes for terrestrial ecosystems, but to degradation of the marine environment despite the parallel presence of a robust fishery policy and/or well-developed marine spatial plan. In these cases, the degradation can be traced to waterborne pollutants as a result of the seemingly sustainable land-use activities. In this poster, we firstly identify cases of where such degradation has not been the case, as a result of purposeful land-use and marine policy integration. These include Australia's 'Paddock to Reef' approach and the Water Framework Directive of the European Union. Secondly, we document preliminary results from of a case study in Quintana Roo, Mexico, of our own investigations into best practice for land-use and marine management integration. Outputs from workshops we have conducted with experts and stakeholders in forestry and coastal management suggest that local, regional, national, and supranational policies need to have an aligned focus on land-use and marine policy integration. A lack of alignment leaves governance voids, which manifest as disconnections between forest-based activities and their impact on marine ecosystems.

GROUP SIZE AND COMPOSITION OF SOTALIA GUIANESIS IN SOUTHERN OF MARACAIBO LAKE, VENEZUELA

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Sotalia guianensis are small delphinids, which inhabit coastal waters in South and Central Americas, is considered "data deficient" by the IUCN. The group size and composition of this species in southern Maracaibo Lake in Venezuela was examined between march (dry season) until November (raining season) of 2016. The surveyed area comprised approximately 900 km². Dolphin groups were encountered on 100 % of boat surveys, and 990 dolphins were observed in 181 separate groups. Group size (mean ± SD: 5.6 ± 4.3 individual) varied from lone individuals to aggregations of up to 250, rarely seen. Groups of two to six dolphins were the most common (63.5 % of observations). No significant differences were found regarding group size among seasons, and either between group size and day period. The larger groups were sighted during feeding and travelling activities. Only 18 % (33) of all groups observed contained calves, and these groups were larger than those without, indicating a possible strategy to protect these individuals and may aid in the calves' development and learning. *S. guianensis* has many ecological and biological parameters poorly known, including group characteristics, and this study represent the first data about group size and composition for this population in southern Maracaibo Lake.

HABITAT DISTURBANCE AFFECTS THE POPULATION STRUCTURE OF PRISTIMANTIS ACHATINUS FROGS IN THE TROPIC

Boris Tinoco, University of Azuay; Karla Neira, Universidad del Azuay; Amanda Quezada, Universidad del Azuay; Juan C. Sánchez-Nivicela, Universidad del Azuay; Verónica Urgilés, Universidad del Azuay

Frogs are among the most threatened vertebrate groups, but population structure of these species in human altered landscapes has been rarely explored. *Pristimantis achatinus* (Craugastoridae) is a widespread species in the north of South America, occupies multiple habitats and has been considered tolerant to human disturbance. This research explores how the relative abundance, sex ratio, age ratio and body condition of *P. achatinus* change along a disturbance gradient that included three habitat types: forests, forest edges, and pastures. We worked in the Andean foothills of southern Ecuador, and employed a block study design to sample frog populations. We placed eleven blocks throughout the study area, each one had three transects, one in each habitat type. Using hierarchical mixed-effects models we tested the influence of habitat type on the population structure and body condition of individuals. The results indicated that habitat type was an important predictor in all the analyzed variables, except for body condition. Relative abundance, and the proportion of juveniles were greatest in the forest edges; moreover, the sex ratio was balanced in the forests edged. All these results indicate that forest edges are a good quality habitat for this species. In general, we show that even frog species considered tolerant to disturbance might need forest remnants in the landscape to maintain viable populations. This study demonstrates that it is necessary to evaluate the structure and dynamic of populations to reveal the impacts of disturbed habitats in frog populations.

HABITAT FRAGMENTATION AND HEALTH INDICES OF HOWLER AND WHITE-FACED CAPUCHIN MONKEYS IN COSTA RICA

Natalia Valverde-Zúñiga, Universidad de Costa Rica; Gerardo Avalos, Universidad de Costa Rica; Ana Jiménez-Rocha, Universidad Nacional de Costa Rica; Edgar Ortiz-Malavasi, Instituto Tecnológico de Costa Rica

The fast pace of human-induced disturbances is affecting the capacity of wild populations to cope with fluctuating resources in fragmented landscapes. Knowledge generation about the factors affecting the incidence and development of infectious diseases in wild populations may help to mitigate those effects. In this study we aim to understand the relationship between fragmentation and health status indicators (i.e., parasitic, hematological and physical condition) of wild populations of Howler (*Alouatta palliata*) and White-faced capuchin monkeys (*Cebus imitator*) in Costa Rica. We collected stool and blood samples of free-ranging individuals of both species for a total of 66 animals assessed in 15 locations along the Pacific and Caribbean slopes. Parasite identification and blood analyses were applied to each sample. To determine the degree of habitat fragmentation, we calculated seven landscape metrics and three annual rates of change. We found that habitat variables were neither related to health indicators in Howler monkeys nor to the presence of parasites. In contrast, the presence of the parasitic roundworm *Strongyloides sp*. in White-faced capuchins increased with decreasing the percentage of forest cover. Hence, a small habitat/matrix ratio favors the spread of pathogens in monkey populations, thus negatively affecting their health condition. The impact of habitat disturbances on pathogen transmission in wild environments is difficult to determine due to the time lag

between disturbances and the expression of their effects on wild populations. Our results on White-faced capuchins can serve as a starting point for further research. To reduce the impact of zoonotic pathogens on wild populations of neotropical primates, conservation actions should lead efforts on maintaining a high habitat/matrix ratio with large and connected blocks.

HABITAT FRAGMENTATION FIRE AND HUNTING SHAPE MAMMALS RICHNESS IN LA GRAN SABANA VENEZUELA

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Habitat fragmentation, wildfire and hunting are disturbances that pose direct threat to wildlife and have gained increasing importance for conservation. According to the Intermediate Disturbance Hypothesis (IDH), middle level of disturbance could promote higher diversity in some ecosystems, but the effect of different disturbances is frequently evaluated separately, disregarding potential synergistic effects. We deployed arrays of camera traps in five blocks of complex landscape with vast savannas in la Gran Sabana (GS) at the border of the Canaima NP. We analysed richness and occupancy of medium and large mammals in response to different levels of the three disturbances within the GS. Hunting pressure was estimated from interviews among indigenous Pemón; incidence of fires and habitat fragmentation from time series of remote sensors spanning the past 14 years. 29 species of mammals were registered, including giant armadillo, tapir and jaguar. Species accumulation curves showed highest richness in undisturbed and intermediately disturbed habitat, partially conforming to the IDH. Further analysis showed a sequence of lower to higher mammalian richness according to the proportion of available habitat (forest cover) and its aggregation (estimated with fractal indices), however available habitat was more important factor than aggregation. The analysis of components of beta diversity (nestedness and turnover) of mammals revealed that specialist (carnivores and insectivores) and large bodied species disappear first as fragmentation increases, while herbivores are more resistant to landscape change. Despite recent demographic and cultural changes, subsistence hunting is present among local indigenous communities and their preferred prey is white-tailed deer (*Odocoileus virginianus*). Its low occupancy (Psi<0,06) is probably due to overhunting caused by overpopulation. These results need to be included in a new, comprehensive and updated management plan for Canaima NP.

HEAVY METAL ACCUMULATION IN MALLARDS (ANAS PLATYRHYNCHOS) AS BIOINDICATORS OF WETLAND EXPOSURE

Katie Gibb, Massey University; Phil Battley, Massey University; Brett Gartrell, Massey University

Anecdotal evidence suggests that mallard populations are declining in most regions throughout New Zealand, yet causes of this decrease are poorly understood. Fish and Game New Zealand have responded by instigating and funding research projects to help identify possible drivers of decline. Heavy metal accumulation and contaminants are one factor contributing to waterfowl population declines globally. Identifying the prevalence and severity of heavy metal exposure in New Zealand waterfowl is a priority. Both pre-breeding (June-July) and post breeding season (January-February) blood samples were analysed to investigate the variation in heavy metal blood concentrations over the year. Egg shells were used to establish the rate of vertical off-loading from females to eggs, and these concentrations were correlated with chick survival rates. Livers collected from hunter-shot birds were used to estimate any differences in exposure levels between two age groups (juvenile and adult). Samples from two spatially separate populations were compared: Waikato and Southland. Concentrations of six heavy metals (Pb, Zn, Cd, Cu, As and Hg) were determined in the blood, liver and egg shells of mallard as part of a pilot study. Initial analyses indicated low but measurable quantities of arsenic, mercury and zinc. There was evidence of significant exposure to lead, copper and cadmium. 15% of birds had plasma lead concentrations above background environmental levels (>0.2ppm) and 10% had plasma lead concentrations consistent with toxicity (>0.4ppm). Females found with toxic blood lead levels died within the subsequent season. Liver concentrations of lead were above toxic thresholds in 5% of birds, cadmium liver concentrations were elevated in 10% of birds and liver concentrations of copper exceeded toxic thresholds in 35% of birds. These findings will guide the wider study and suggest ongoing contamination of wetlands in New Zealand with heavy metals, especially Pb, Cd and Cu.

HIGH AND INCREASING NIGHTLIGHT POLLUTION AROUND PROTECTED AREAS AND WITHIN BIODIVERSITY HOTSPOTS

Adrien Guetté, University of Nantes; Laurent Godet, University of Nantes; Martin Juigner, University of Nantes; Marc Robin, University of Nantes

Together with noise, artificial nightlights are one of the most important indirect sources of pollution induced by

the worldwide urban sprawl. Although its adverse effects on biodiversity have been well documented, a worldwide view of its spatial and temporal trends according to the areas of the highest conservation stakes is still missing. We mapped the mean nightlight pollution as well as its temporal trends at a worldwide scale from 1993 to 2012, and crossed this with the spatial distribution of both protected areas and biodiversity hotspots. We found that both mean nightlight pollution and its temporal trends were lower within protected areas than out of them but that they were the highest and increased at their periphery. Mean nightlight pollution and its temporal trends were higher within biodiversity hotspots and decreased as one moved away. As nightlight pollution can be viewed as a proxy or a component of the global human footprint, this study reveals that if protected areas were partly saved from human pressures, they tended to constitute more and more isolated less-impacted patches, and the major world biodiversity reservoirs were submitted to a high and increasing human pressure.

HIGH LEVELS OF INCONSISTENCY BETWEEN AUSTRALIAN THREATENED SPECIES LISTS AND PROCESSES

Chris Sanderson, University of Queensland; Chris McGrath, University of Queensland; Hugh Possingham, The University of Queensland; James Watson, Wildlife Conservation Society

Legislation, and related policies, are among the strongest and most effective tools for halting species declines. However, even in countries with well-established threatened species legislation many species are still in decline (e.g., USA, Australia, the European Union). This indicates a need to reflect on where current legislative processes are failing. Using Australia, a mega-diverse country that has several layers of environmental legislation, as a case study we explored two aspects of threatened species listing policy to identify areas of inconsistency of process between jurisdictions. First, we reviewed the different processes undertaken for creating threatened species lists in each of Australia's state and federal jurisdictions. Second, we analysed the differences in threatened species status for selected taxonomic groups to compare the outcomes of the various listing processes and to allow for comparisons across jurisdictions. Each jurisdiction in Australia has a different threatened species listing process, with conservation status categories and listing criteria varying dramatically between some jurisdictions. Only 5% of all birds and 12% of frogs listed as threatened have a consistent status across all jurisdictions in which they occur. The status of species differs by two or more categories for 64% of listed birds, and 49% of listed frogs. For example, Gouldian Finch (*Erythrura gouldiae*) is listed variously as Rare, Near-Threatened, Vulnerable, and Endangered across five jurisdictions. These findings show substantial inconsistencies in both approach and outcome of threatened species listing processes in Australia. Current efforts to harmonise listing processes in Australia and elsewhere should be encouraged, as the current lack of consistency has the potential to cause major confusion in conservation efforts and environmental assessments that cross borders.

HISTORICAL DENSITY AND RECENT TRENDS IN FOREST DUIKER POPULATIONS IN AFRICAN NATIONAL PARKS

Timothy Obrien, Wildlife Conservation Society

African forest duikers (Bovidae, Cephalophinae) are among the top species used for subsistence and commercial bushmeat but the difficulty of accurately assessing population trends has led to questions about sustainability of bushmeat harvests. We review the literature on duiker population estimation. We then analyze the results of annual camera trap monitoring at 6 national parks in East and Central Africa, using dynamic occupancy and point abundance models to establish trends for 18 populations of 9 duiker species. Between 1973 and 2013, published density estimates of duiker populations declined significantly throughout Africa irrespective of monitoring methods and species. Initial occupancy values were above 0.5 for 12 populations and initial point abundance averaged 2.0 per point as expected for monogamous territorial antelope. Trends in local distribution declined significantly for 10 populations, including 8 species, and were stable or increasing distributions for 8 populations of 4 species. Point abundance trends were increasing or stable for 12 populations of 6 species and declined in 4 populations of 4 species. Two populations were too rare to estimate point abundance. Six species declined in both distribution and abundance, 2 species increased in both distribution and abundance, and 1 species shows stable distribution but declining abundance. We failed to detect expected species in 4 parks, indicating local extinctions. Current monitoring methods for duikers include line transect and dung surveys but these methods have problems distinguishing between species. Combining species ignores the complex dynamics of duiker communities and may miss population crashes. We recommend the use of camera traps for monitoring forest duiker population trends as camera traps allow for better species recognition and development of species-specific trends.

HUMAN DISTURBANCE DRIVES SHIFTS TOWARDS NOCTURNALITY IN LARGE MAMMALS

Kaitlyn Gaynor, University of California - Berkeley; Justin Brashares, University of California - Berkeley; Cheryl Hojnowski, University of California - Berkeley

Humans have a pervasive influence on ecosystems across the world, with well-documented effects on animal behavior, ecology, and conservation. Animals frequently avoid areas of high human activity, perceiving risk not only from direct harassment and hunting but also non-lethal activities and infrastructure. In places where humans and animals coexist, animals may exhibit temporal avoidance of humans, shifting their activities to avoid overlap with humans in time rather than space. In particular, recent studies suggest many large mammal species may be shifting their activities toward nocturnal hours. The extent to which these shifts are occurring globally is currently unknown. To examine anthropogenic effects on large mammal diel activity patterns, we conducted a meta-analysis using telemetry, camera trap, and observational data from over 100 case studies across gradients of human disturbance. Our study reveals strong evidence that humans are creating a more nocturnal world as animals shift activity to the nighttime. Changes in the timing of animal movement, foraging, and habitat use are present across continents, habitats, taxa, and types of human activity. Such responses can result in dramatic shifts away from natural diurnal patterns, with effects on foraging and hunting efficiency, predator and competitor detection, and social behavior that may affect individual fitness and population persistence. Temporal community dynamics may also change as species exhibit differential responses to humans, altering patterns of competition, predation, and herbivory. However, shifts in activity pattern may represent adaptive temporal niche partitioning that allows for humans and wildlife to share the same space. As the human footprint expands across the globe, temporal avoidance of humans can reduce human-wildlife contact and potentially conflict.

IDENTIFYING HIGH-QUALITY HABITATS FOR THE CRITICALLY-ENDANGERED RED SISKIN IN VENEZUELA

Ada Sánchez-Mercado, Instituto Venezolano de Investigaciones Científicas; José Rafael Ferrer-Paris, IVIC; Michael Braun, Smithsonian National Museum of Natural History; Arlene Cardozo-Urdaneta, IVICBrian Coyle, Smithsonian National Museum of Natural History; Kathryn Rodriguez-clark, Centro De Ecologia - Ivic

We used data for the Red Siskin (*Spinus cucullatus*), a critically endangered Neotropical bird, to identify key habitats for conservation in spite of limited information on habitat use and species ecology. We aimed to estimate: 1) the Red Siskin's historic distribution in Venezuela; 2) the portion of habitat lost to vegetation degradation; and 3) the location of key habitats, or areas with both a high probability of historic occurrence and a low probability of vegetation degradation. We ground-truthed 68 locations, classifying species' habitat suitability there as excellent, good, regular, or poor. We fit a random forest model to relate these with an Enhanced Vegetation Index (EVI) time series. We estimated the probability of historic occurrence by fitting a MaxLike model using 88 presence records (1960-2013), and data on forest cover and aridity index. Eighty five percent of ground-truthed locations had substantial reductions in mean EVI, while 21% of the sampling universe (19,302 km2) had a probability of Red Siskin occurrence over 0.7, although only 22% of this was under protection. Our models revealed key habitats in the western and central regions of Venezuela, forming small blocks totaling just 1,109 km2. Decline in Area Of Occupancy over 15 years was between 39-94%, corresponding to an extinction risk category between Vulnerable and Critically Endangered. Ongoing vegetation degradation could limit the establishment of reintroduced populations in eastern areas, but the conservation of remaining key habitats on private lands in the central region could be improved with biodiversity-friendly agri- and silviculture programs.

IDENTIFYING MARINE BIODIVERSITY AT RISK FROM OFFSHORE OIL AND GAS EXPLORATION AND EXTRACTION

Ruben Venegas Li, University of Queensland; Salit Kark, The University of Queensland; Noam Levin, Department of Geography, The Hebrew University of Jerusalem; Hugh Possingham, The University of Queensland

Human global demand for energy has pushed the energy industry to intensify its offshore activities, especially oil and gas extraction. The expansion of these activities in the ocean poses several potential threats to biodiversity, such as an increase in noise pollution, chemical contamination from drilling and transportation (e.g., spills and drill cuttings), physical changes to the seafloor (dredging, drilling and pipe laying), and an increased contribution to greenhouse gasses. The aim of this research is to quantify the overlap between globally important areas for marine biodiversity with offshore oil and gas activities. We consider this as an important first step for prioritising actions that allow avoiding or mitigating potential negative impacts from offshore fossil fuel extraction on biodiversity. We have compiled a database on offshore oil and gas activities globally, and characterised their spatial

and temporal distribution. We use this information to quantify their overlap with areas that have been identified as important for marine biodiversity through various international or national agreements (e.g., MPAs, EBSAS). Furthermore, we assess specifically what habitats and species of conservation concern at a global scale can be potentially impacted by the offshore oil and gas industry. This poster presents the methodology that is employed in this study, and share initial research findings. For example, 70 marine protected areas, 153 ecologically of biologically significant marine areas (EBSAs), and 153 important bird areas are within a 20 km radius of oil and gas platforms under production. In the poster we will also present a discussion on potential methodologies in which the results can be used to prioritise conservation actions in the phase of oil and gas activities in the ocean.

ILLEGAL EXTRACTION OF JUÇARA PALM IN ATLANTIC FOREST AND CONSEQUENCES FOR THREATENED SPECIES

Eduardo Roberto Alexandrino, Universidade de São Paulo; Mariana Landis, Instituto Manacá; Katia Ferraz, ESALQ - University of Sao Paulo; Roberta Paolino, ESALQ - University of Sao Paulo; Rodrigo Printes, ICMBio; Pietro Scarascia, Fundacion Florestal

The Atlantic Forest is among the most threatened biomes in the world and this situation is aggravated by illegal extraction of natural resources, which persist in Protected Areas. The lack of understanding of the pressures negatively reflects in current species conservation status and make difficult to elaborate strategies for threats mitigating. Between April and August of 2013, using snowball method, we identified 16 informants that inhabit the region with the lowest Human Development Index of São Paulo State. Interviewed people whose live from illegal extraction of the juçara palm (*Euterpe edulis*) affirmed that association of palm extraction with hunting is frequent. Informants mentioned two endangered species frequently hunted in the region: lowland tapir (*Tapirus terrestris*) and southern muriqui (*Brachyteles arachnoides*). In their perception, hunting caused the reduction of these species abundance. For most interviewees, fiscalization is effective and keep them far from illegal activities, resulting in a hunting reduction in recent years. The results also suggest two profiles of hunters: those interested only in hunting, acting around their own properties and the 'palm harvesters' that associate the palm extraction with hunting, acting in Protected Areas. The species populational study we conducted shows a high abundance in the region with low incidence of anthropic pressures, converging with interviewees' perception. A worrying factor is that there is a higher concentration of juçara palm in these localities. The lowland tapir and southern muriqui are low resilience species, being susceptible to extinction. Considering the threat level of these species, it's necessary to implement measures to reduce illegal extraction of the juçara palm. This reduction would also control hunting pressure, contributing to reverse current situation of cinegetic species of Atlantic Forest and to prevent that pressure from going forward to regions with greater mammal's abundance.

IMPACT OF A COMMUNICATION INTERVENTION OF MATSIGENKA KIDS TOWARD GIANT OTTERS IN PERU

Jenny Glikman, Institute for Conservation Research, San Diego Zoo Global; Lourdes Arangüena Proaño, SDZG-Peru; Cesar Flores, SDZG-Peru; Jessica Groenendijk, SDZG-Peru; Ron Swaisgood, SDZG

In 2014, 'Tito and the giant otter' a bilingual book (Matsigenka and Spanish) was created to integrate scientific and traditional knowledge about different environmental issues. The book highlights the connection between the Matsigenka and their aquatic environment using the endangered giant otter as a flagship species for conservation. In 2016, we started the evaluation of the book to assess the impact in terms of the understanding about rainforest conservation, through a combination of the participatory evaluation approaches. A total of 28 high school children participated in both pre-test (June 2016) and 22 in the post-test (November 2016) phases respectively. The project was initially presented and explained to the boarding school representatives and the guardians of the Matsigenka children in Boca Manu, a community within the Manu National Park. The evaluation included both a drawing assessment followed by an interview. All the students of the high school draw answering the prompt "What does the nearest river/ cocha mean to you?" and subsequently were individually interviewed using a mix method questionnaire. At the end of the pre-test phase, each child received the book to read in the following months. Pre- and post-attendance drawings were scored with a rubric. The overall assessment documented significant inclusion of humans and a growth in the understanding of the essential components, processes of the ecosystem.

IMPACT OF RAPID DEFORESTATION ON DYNAMICS AND ECOLOGY OF DISEASE VECTORS AS MOSQUITOES IN CAMEROON

Piam Djomo Jordane, Global Environmental Protect; Anthony Cornel, University of California, UC Davis Department of Entomology and Nematology; Eric Nana,

Higher Institute of Environmental Science; Kevin Njabo, University of California, La

Deforestation can be defined as the conversion of the forested area to non-forest land through cutting, clearing and dram oval of rainforest or related ecosystem into less bio diverse ecosystem such as pasture crop land, plantation, urban use logged area. Deforestation can transform whole ecosystems, and thus affect disease transmission, we studied the diversity and effect of rapid deforestation on avian malaria vector communities' changes in a lowland forest corridor located between four protected areas in southwest Cameroon. Specifically, we intend to (1) identify mosquito species at three sites pre- and post- deforestation; (2) determine how human-altered environments affect the feeding patterns of insect vectors. The study population comprised mosquitoes of different genera and species. Mosquitoes will be collected from the tropical rain forest of Talangaye, using the net traps. Mosquito traps were set up every 200m along the sample area (transects) Mosquitoes from the different traps were removed add from collection cups by using an oral aspirator and then were immobilized with chloroform soaked in a cotton ball in a different container (source). The immobilized mosquitoes were then sorted by sex, identified to species using a stereomicroscope (×90). Identification of mosquito specimens was facilitated by using morphological keys for (Toxorhynchitine, Anophelines) and Culicine). Preliminary result, we collected a total of 3231 mosquitoes; 7 genera; 42 species. Culex (13 species) Aedes (12 species) Uranotaenia (04 species) Eretmapodites (07 species) Anopheles (03 species) Toxorynchites (01 species) Hodgesia 02 species. Our work demonstrates that deforestation affects the diversity of mosquitoes. The diversity of mosquitoes varies according to seasonality, and deforested site.

IMPACTS OF QUARRY ACTIVITIES ON WATER RESOURCES AND EFFECTS ON BIODIVERSITY: THE ODONATA ASSESSMENT

Emmanuel Taye, University of Ghana; Rhoda Brown-Wood, University of Wisconsin-Madison

The Ghanaian economy depends on mining for economic growth. However, mining activities have had negative impacts on water resources across the country and the biodiversity that depend on them. This study used Odonates to assess the impact quarry activities have on the water resources. Odonata assemblages along water bodies are a good indicator of water quality. They respond quickly to changes in environmental conditions both in and around the water bodies hence, their use as effective monitoring tools for the study. Three water bodies- two inside the quarry and one 800 m from the quarry- were monitored using a combination of adult male counts, observation of adult female oviposition behavior, a larval survey in benthos and aerial search for exuviae. 179 individual Odonates comprising 18 species were recorded during bi-monthly surveys.15 of the species (79.9%) belong to suborder Anisoptera (Dragonflies) and 3 (20.1%) belong to suborder Zygoptera (Damselflies). Species abundance was higher (51.9%) around water bodies at the quarry than outside the quarry site. The heterogeneity of habitats on site accounts for the high species diversity and abundance. The two most abundant species recorded *Pantala flavescens* (33, 18.4%) and *Palpopleura lucia* (32, 17.9%) are generalists that are found over wide ranges of habitats. The data was verified using physico-chemical analysis data of the water samples which indicated that the water within the quarry site was less degraded compared to the water outside the quarry. Findings reveal that the quarry, against popular opinion is serving as a biodiversity hotspot for Odonatans as well as other biodiversity components and thus having minimal negative impact on the environment and subsequently on biodiversity.

IMPACTS OF THE INVASIVE OYSTER CRASSOSTREA GIGAS ON THE INDIGENOUS BIODIVERSITY

Laurent Godet, Centre National de la Recherche Scientifique; Laurent Barillé, Université de Nantes; Bruno Cognie, Université de Nantes; Priscilla DECOTTIGNIES-COGNIE, Université de NantesCaroline Echappé, Université de Nantes; Pierre Gernez, Université de Nantes; Vona MÉLÉDER-TARD, Université de Nantes; Carl REDDIN, Université de Nantes; Vincent TURPIN, Université de Nantes

The Oyster *Crassostra gigas* is a cultivated species, which has become an invasive species in the recent years along the French coasts. Its impacts on the local biodiversity were however seldom studied. Here, we performed a three years experimental study in an intertidal area, by removing the oysters from a rocky area (test zone) and letting the oyster in another rocky area (control zone). We monitored different compartments of the trophic food web (microalgae, benthic meiofauna and macrofauna, and shorebirds) in the intertidal mudflats surrounding these areas, before and after removing the oysters. Contrary to the control zone, we found significant changes in the different trophic compartments after oyster removal in the test zone, suggesting that oysters have a strong influence on the trophic food webs. This study demonstrates that exotic cultivated species may have a strong influence on coastal biodiversity, especially when such species develop out of the shellfish farms.

INCLUSIVE INDICATORS TO ASSESS AND FOSTER SOCIAL EQUITY IN PROTECTED AREAS BY 2020

Noelia Zafra-Calvo, Center for Macroecology, Evolution, and Climate, University of Copenhagen

Addressing social equity is one of the main challenges for successfully protecting biodiversity and ecosystem services by 2020; as it has been committed by 196 countries in the Aichi Target 11. Significant gaps remain in our understanding of equity and the practical implementation of equitable policies in protected areas. One of the main gaps is the lack of a systematic way to assess and monitor social equity due to changing context-dependent perceptions of the notion of equity and the challenge of reducing social equity to a series of metrics. We propose an approach that defines a set of indicators for operationalizing equity assessments in protected areas and monitoring the progress towards equitably managed protected areas able to report on Aichi Target 11, whilst also retaining flexibility to be adapted to context-specificities. We call for mainstreaming these equity assessments in protected areas globally to improve their management at the site level. The approach and suggested indicators here is a first step in this direction.

INEFFECTUAL MANAGEMENT OF BUSHMEAT EXPLOITATION IN GHANA

Hannah Naa Kai Sackey, University of Ghana; Kofi Amponsah-Mensah, University of Ghana; Yaa Ntiamoa-baidu, University of Ghana; Erasmus Owusu, University of Ghana

The change from subsistence to commercial hunting has led to hunters increasingly exploiting several ways (mostly illegal and unregulated ways) of improving their income. This study explored the effectiveness of wildlife protection regulations in the Mankessim area in the Central Region of Ghana and implication for protected species conservation. Methods used included direct observations on traded species and interviews with key actors in the bushmeat trade within the market and hunters' villages. A total of 3,743 carcasses comprising 19 species of wild animals were recorded during the study. Of the 18 species recorded in the Closed season for hunting, 17 were protected species (including primates) of which four were wholly protected whose hunting is prohibited all year round. Majority (93%) of the 58 respondents were aware of the existence of laws governing the hunting/ trading of bushmeat species in Ghana. All the hunters interviewed did not have hunting licenses. Most of the traders had expired licenses. Wildlife laws are not restrictive enough and due to inadequate wildlife law enforcers, the laws are not complied with. There is an urgent need for further awareness campaigns directed especially at the various bushmeat actor groups, to sensitize and improve their knowledge and respect for wildlife legislation. Furthermore, with the inadequacy of wildlife protection agencies to enforce the laws, key actors themselves would have to embrace measures and practices that will regulate bushmeat exploitation.

INFECTION OF THE FITTEST: DEVIL FACIAL TUMOUR DISEASE

Hamish McCallum, Griffith University; Konstans Wells, Griffith University; Rodrigo Hamede, University of Tasmania; Paul Hohenlohe, University of Idaho; Menna Jones, University of Tasmania; Douglas Kerlin, Griffith University; Andrew Storfer, School of Biological Sciences

Emerging infectious diseases are important threats to wildlife populations. They rarely affect all members of a population equally and determining how individuals' susceptibility to infection is related to other components of their fitness is critical to understanding disease impacts at a population level and for predicting evolutionary trajectories. We introduce a novel state-space model framework to investigate survival and fecundity of Tasmanian devils (Sarcophilus harrisii) affected by a transmissible cancer, Tasmanian devil facial tumour disease. We show that those devils that become host to tumours have otherwise greater fitness, with higher survival and fecundity rates prior to disease induced death than non-host individuals that do not become infected, although high tumour loads lead to high mortality. At the population level, a recent decline in the force of infection suggests that devils may be developing resistance, but little change in the effect of tumour load on mortality through time indicates no evidence of increased tolerance of the cancer.

INSIGHTS FROM SOUTH AFRICA: THE IMPORTANCE OF GEOLOGICAL HISTORY IN RIVERINE BIOMONITORING

Sukhmani Mantel, Rhodes University; Helen Barber-James, Albany Museum; Terence Bellingan, Rhodes University; Ferdy de Moor, Albany Museum

Freshwater macroinvertebrate surveys of the Mediterranean climate Cape Fold (Tsitsikamma) region show community differences linked to gondwanan geology and historic sea level fluctuations. This region's fauna has a cold-adapted gondwanan origin with high endemicity and adaptation to the naturally acidic rivers. Twenty sites along 11 rivers were investigated seasonally over 2 years using biomonitoring sampling, comprehensive faunal surveys and physico-chemical assessments.

Ordination analyses of biomonitoring and water quality data show distinct clustering of sites, particularly influenced by pH and conductivity. Most of these rivers run through ancient Palaeozoic Table Mountain Sandstone (TMS) (> 400 Ma). Due to long-term leaching removing minerals from TMS, these rivers have little buffering capacity, causing highly acidic water. Samples from the 3 most western rivers that are less acidic, flowing over a younger Cretaceous formation (c. 140 Ma), cluster with lower reaches of the 2 most eastern rivers which flow over more recent (< 65 Ma) Palaeogene alkaline sandstone deposits of marine origin that have experienced sea level changes. Lower biomonitoring scores in these eastern and western rivers can be interpreted as indicating poorer water quality. However, the lower scoring sites have more neutral to alkaline pH and higher conductivity (linked to the geological history) which influences the fauna. The lower biomonitoring scores are reflective of a more widespread, less specialised fauna, rather than poor water quality. The family-based biomonitoring protocol shows similar patterns to a separate species-level analysis. These results emphasize the need to consider the natural local conditions when interpreting macroinvertebrate indices before concluding that water quality is poor. In the context of the high endemicity of the riverine fauna, in an area which is rapidly developing, there is need to protect and monitor these rivers to sustain the rare populations.

INSIGHTS INTO PRE-FLEDGING BEHAVIOR AND PHENOLOGY FROM TRAIL CAMERAS ON TRANSLOCATED SEABIRDS

Megan Dalton, Pacific Rim Conservation; Marilou Knight, Pacific Rim Conservation; Charles Kohley, Pacific Rim Conservation; Hannah Nevins, American Bird Conservancy; Andre Raine, Kauai Endangered Seabird Recovery Project; Heather Tonneson, U.S. Fish and Wildlife Service; Eric Vanderwerf, Pacific Rim Conservation; Lindsay Young, Pacific Rim Conservation

Two of Hawaii's endemic seabird species, the Newell's Shearwater (*Puffinus newelli*; NESH) and Hawaiian Petrel (*Pterodroma sandwichensis*; HAPE), are listed as endangered and are rapidly declining in numbers. In 2016, we moved 7 NESH and 20 HAPE chicks from natal nesting areas to artificial burrows within a 7-acre predator-proof enclosure at Kīlauea Point National Wildlife Refuge in an ongoing attempt to establish a breeding colony there. This site is safe from common threats such as predation by invasive mammals, light pollution, and habitat degradation. We placed trail cameras at burrow openings to record pre-fledging behavior and phenology. The motion-activated cameras recorded video and photos of the chicks' activity from which we documented times of nightly emergences and returns to the burrow, the number of times the chicks came out each night, and their general dispositions and behavior. From these observations, we were able to elucidate some pre-fledging behavioral trends, an aspect that is little known from these nocturnal, burrow-nesting species. There were some similarities in behavior between the species, such as increased time outside the burrow and apparent restlessness as fledging approached, as well as some differences, especially in the methods of exercise. Number of emergences per night were variable among individuals of both species (range of 0-6, mean=1.7/night for NESH; range of 0-9, mean=2.6/night for HAPE) and did not appear to correlate with changes in mass or wing chord measurements over time. First nightly emergences peaked from 18:00-20:00 for both species, while the last nightly return-to-burrow peaked between 03:00-06:00 for NESH and 21:00-03:00 for HAPE. Observations gleaned from trail cameras may be valuable to future chick translocations of these and other species as well as management of wild breeding colonies, especially with regards to the timing of predator control.

INSPIRING SEA TURTLE STEWARDSHIP IN ST. KITTS WITH VOLUNTARY CERTIFICATION THE IMPLEMENTATION PHASE

Sara Ramirez, St. Kitts Sea Turtle Monitoring Network; Kimberly Stewart, St Kitts Sea Turtle Monitoring Network; Eric Wiener, Ramapo College of NJ

The past decade has seen a shift to a tourism-driven economy and an associated boom in development in St. Kitts and Nevis, West Indies, which is threatening the Federation's natural resources, including sea turtles. As a countermeasure, the voluntary certification program, TURTLE APPROVED, was initiated in June 2014 with the aim of educating and encouraging businesses in St. Kitts to adopt sea turtle friendly practices. This interdisciplinary program utilizes ecological and economic strategies to harness the influence of the tourism industry and employ local businesses as the front lines for a national sea turtle stewardship movement. Three categories of CERTIFIED TURTLE APPROVED criteria required for compliance serve to sustainably manage sea turtle-business interaction in beachfront, in-water, or inland conditions. Now in its implementation phase, TURTLE APPROVED is in the progress of aiding pilot businesses in reaching compliance and earning CERTIFIED TURTLE APPROVED status. Here, we will discuss current implementation status, monitoring and evaluation efforts, lessons learned, and future plans for the program. TURTLE APPROVED can serve as a framework for other countries to adapt to their site-specific needs in finding a balance between sea turtle conservation and sustainable tourism. The overarching

goal of the TURTLE APPROVED program is to catalyze a national sea turtle stewardship movement in St. Kitts and Nevis, influence policy, and incorporate living sea turtles into the Federation's Cultural Heritage. It is our hope that by using sea turtles as a focal species, TURTLE APPROVED will ultimately influence national perceptions of the Federation's natural resources, improving their valuation, management, and governance.

INTEGRATING INSTRUMENTS OF CLIMATE CHANGE FOR THE MANAGEMENT OF PROTECTED AREAS IN COLOMBIA

Mario Londono, Asociación de Biólogos Ambientales (Environmental Biologist Association)

Colombia is working on the establishment of new protected areas to accomplish the Aichi goals under the Convention of Biological Diversity (CBD), however the declaration or management of protected areas in the country display some limiting factors such as the lack of funding, the lack of scientific and ancestral knowledge and the lack of articulation with other sectors, among others. On the other hand, there is a national need to comply with the Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC), which entails commitments to mitigation and adaptation related to climate change in the country. Based on the above, the present research generated a revision of the UNFCCC's Nationally Appropriate Mitigation Actions (NAMAs) instrument and it was possible to determine which features of the instrument could be key to resolving the limitations of the country's protected areas. Based on this review, a NAMA for the Establishment and Management of Protected Areas for Mitigation and Adaptation to Climate Change in Colombia was designed, which goal is to overcome the problems of funding, managing and handling new (and already existing) protected areas in the country. This NAMA generates a proposal of the methodological framework for the inclusion and accounting of the contribution of the protected areas in the mitigation of the climatic change. Furthermore, it analyzes how buffer zones of the protected areas can benefit economically by being financed by ecosystem services including carbon sinks as an integral part of NAMA. Finally, it is concluded that the articulation of instruments and management of the international environmental commitments of the country can respond to the particular problems of each commitment and be a new option to strengthen the processes of conservation of Colombian biodiversity.

INTEGRATION OF TETRACARPIDIUM CONOPHORUM IN LAND USE SYSTEMS CONTRIBUTE TO BIODIVERSITY CONSERVATION

Choungo Patrick, Higher Institute of Environmental Sciences; René Jiofack, Higher Institute of Environmental Sciences; Zac Tchoundjeu, World Agroforestry Centre

Tetracarpidium conophorum is a vine of Euphorbiaceae family producing edible fruits and presenting a wide distribution across West and Central Africa. This liana is classified among multipurpose agroforestry trees providing non-timber forest products with a lot of properties. Local population transforms their nuts into powder to obtain a proteinic food supply and hypocholesterolemian / hypotriglyceridemian vegetable oil. It is also commonly used in traditional medicine to cure several diseases. The vine is highly marketed in Cameroon and neighboring countries while the hole plant is used in cocoa-agroforestry based systems to improve shade; livelihoods and contribute to carbon sequestration. Despite all the functionalities of this species, the lack of knowledge on the conservation status and ecological potentialities of the liana is a hindrance for sustainable management of liana and biodiversity conservation criteria. Therefore, the objective of the study is to assess the conservation status and ecological potentialities as well as carbon sequestration potential in some selected agroforestry systems in the Mbam and Inoubou division in Cameroon. Preliminary results demonstrate higher sustainable conservation of *T. conophorum* associated with local fruiting species in cocoa-agroforestry based systems to improve soil fertility, carbon sequestration, biodiversity conservation and landscape management. Regarding the carbon sequestration, the method of Chave et al. (2005) was used to calculate the carbon. So, an aerial carbon biomass varying from 10.48 tC/ha, 18.52 tC/ha and 2.53 tC/ha, respectively in cocoa-agroforestry based systems. Surveys conducted revealed that the specie is very useful and there is urgent need to develop raw materials with higher characteristics that should be integrated in the farmer's lands with the aim of enhancing their livelihoods and boost its conservation's status in tropical areas.

INTERACTIVE EFFECTS OF INTENSIVE FOREST MANAGEMENT AND WILD HERBIVORES

Thomas Stokely, Oregon State University, College of Forestry; Matthew Betts, Oregon State University

Intensive land management practices provide for a growing human population by increasing the production and uniformity of crops. As more forest land is being intensively managed as plantations, the homogenization of forest ecosystems may alter the interactions between wildlife and their habitats. We hypothesized that by

homogenizing regenerating forest vegetation, intensive forest management practices alter large herbivore foraging behavior; the compounding effects of herbivory and management intensity should further simplify plant communities and favor crop tree development. To test this hypothesis, we constructed 225 m2 wild deer and elk exclosures, nested within a manipulated gradient of management intensity (3 herbicide treatments and a no-spray control), replicated at the scale of whole harvest units in the Pacific Northwest (PNW), USA. Herbivory had a disproportionate effect on vegetation within managed plantations that received a commonly-used herbicide prescription. Herbivory exacerbated the effect of herbicide treatment on native forage species, favoring crop-tree growth as a result of trees being released from competition. Deer and elk thus provided an ecosystem "service" to plantations by browsing plants that compete with crop trees, although this service came at the cost of reduced native forage regeneration. However, untreated, vigorously regenerating and diverse native plant communities were resilient to herbivore pressure. Our findings suggest that the effect of herbivory on plant communities is mediated by land management practices that alter forage composition and availability. Our results support the hypothesis that management intensity and herbivory interact to drive not only plant community structure, but ecosystem services valued by humans.

INTERNATIONAL TRADE TRENDS IN CITES LISTED SPECIES IN COLOMBIA

Marcela Delgado, Pontificia Universidad Javeriana; Maria Piedad Baptiste, Instituto de Investigación de Recursos Biológicos Alexander von Humboldt; Jose Nicolás Urbina-Cardona, Pontificia Universidad Javeriana

Overexploitation of wild fauna and flora species is considered one of the five motors of biodiversity loss in the world. As trade in wild animals and plants crosses borders between countries, their regulation requires international cooperation in order to protect certain species from overexploitation. CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) was conceived within the framework of this spirit of cooperation. Today, it offers varying degrees of protection to more than 35,000 species of animals and plants, whether marketed as living specimens, such as fur coats or stuffed herbs. In 1975, this international agreement concluded between governments, came into force with the aim of ensuring that international trade in specimens did not constitute a threat to their survival. In the last decade, there has been an increase in transactions, as well as a change in the use of the wild-type extractive model to closed-cycle model such as captive or mixed model as ranching. This study seeks to examine trends in international trade in CITES-regulated wildlife in Colombia. The main importing countries, the most traded species, the variation in use patterns and their contributions to species conservation, were identified in the 1976-2015 period, using the CITES trade database managed by the UNEP World Conservation Monitoring Centre (UNEP-WCMC). The present study proposes criteria and indicators, which can help to evaluate the contribution to the conservation of the different use models, as well as monitoring and controlling the effective implementation of CITES.

IS LA GUAJIRA A PROMISING NURSING HABITAT FOR ENDANGERED NEARSHORE BENTHIC MARINE SPECIES?

Catalina Vasquez-Carrillo, University of Miami; Kathleen Sullivan-Sealey, University of Miami

A key challenge to conservation of endangered marine species is a thorough understanding of all life stages with specific habitat requirements. Sea turtles as long-lived marine reptiles present such a challenge to understand the specific requirements of the decades-long juvenile state. The Colombian region of La Guajira in the southern Caribbean supports high biological productivity, attributed to both the coastal geomorphology and persistent surface upwelling which provides nutrients to an otherwise oligotrophic sea. This high productivity supports the both water column and benthic plant production. Nearshore seagrass and macroalgae communities dominate rather than coral reefs; these marine plant communities provide an ideal larval and juvenile habitat for marine fishes and sea turtles. Historically, there has been little coastal development, and the tropical arid environmental conditions have prevented anthropogenic disturbances. Detailed habitat studies and ecological assessments have been limited throughout the peninsula. Our research characterized the shallow benthic submerged aquatic vegetation (SAV) natural communities as related to the population, habitat use and health of the green sea turtle (*Chelonia mydas*). An assessment of the diversity and biomass of macroalgae species along high energy beaches and rocky shores defined unique natural communities along the Colombian Caribbean coast. Fleshy red macroalgae, especially in the genus Gracilaria, dominated the nearshore benthos along high energy shorelines. Surveyed juvenile and adult sea turtles are feeding on macroalgae proportionally more than on any other diet items. Juvenile turtles in La Guajira have higher body condition indexes than other populations in the Caribbean, but similar to populations in the Pacific where upwelling also occurs. La Guajira presents a unique ecosystem

setting, with characteristics compatible with the nursery requirements of green sea turtles.

LANDSCAPE DIVERSITY OF BIRDS IS ENHANCED BY RETAINING KEY NATURAL COMPONENTS IN RURAL ENVIRONMENTS

Mark Hall, La Trobe University; Andrew Bennett, La Trobe University; Dale Nimmo, Charles Sturt University; Simon Watson, La Trobe University

Vast changes in land-use globally mean that the future for nature conservation in many regions depends on the capacity of species to persist among natural habitats in farming landscapes. Here, we used a landscape-level natural experiment to investigate bird community responses to the presence, or loss, of three types of landscape element typical of productive farmland in Australia: streamside tree cover, roadside tree cover, and scattered paddock trees. We selected 44 landscapes (each 1 km diameter), stratified to represent four combinations of these landscape elements: a) landscapes with all three wooded elements present (n=11), b) landscapes lacking riparian trees (n=11), c) lacking roadside trees (n=11), and d) lacking scattered trees (n=11). We systematically surveyed birds at multiple points across each landscape to calculate the impact of the loss of each type of landscape element on alpha, beta and gamma diversity. Gamma (landscape) diversity was reduced by the loss of any type of wooded vegetation, driven primarily through a reduction in alpha (site) diversity. Loss of streamside tree cover had the greatest impact, reducing gamma diversity by one-third for all landbirds and by half for woodland-dependent birds, compared with landscapes that retain all three elements. Breeding activity was halved in landscapes lacking streamside vegetation; and distinct compositional changes occurred, benefitting species better able to inhabit modified environments. With intensification of farming practices, these elements are under threat in many rural environments. Their loss will reduce an avifauna already in decline, potentially leading to homogenisation of communities across regions. The retention of key elements, such as streamside vegetation, is feasible and practical, with multiple benefits for landholders. A 'whole-of-landscape' approach to the conservation and management of biodiversity offers new insights for conserving species at risk in farming landscapes.

LANDSCAPE PATTERNS AND TRENDS IN NICARAGUA, A RAPIDLY CHANGING BIODIVERSITY HOTSPOT

Thomas Albright, University of Nevada, Reno; Thomas Gillespie, University of California, Los Angeles

Nicaragua has tremendous biological and natural resources, contains the largest tropical rainforest area in the Americas outside of Amazonia, plays an important role in a regional biological corridor, and is seeing growth in "ecotourism" and related activities. However, Nicaragua is undergoing a variety of economic and environmental changes, including rapid rates of forest loss, even amidst its emerging protected areas network. Yet, information on patterns and trends of key landscape variables is often lacking and not well elaborated in relation to protected areas and other geospatial units. Here, we describe a series of spatial and change analyses for Nicaragua, its biomes, and protected areas networks. Specifically, we look at satellite-derived data (e.g., land surface temperature, land cover, cloud cover), weather and climate data (e.g., temperatures, precipitation), and topographic variables (e.g., elevation, slope, aspect). For a subset of these, including forest cover, we examine changes occurring in the recent decades. We find a tremendous diversity of landscape conditions (combinations of topography, land cover, climate) in Nicaragua. The protected area estate is representative of much of the diversity of these conditions, but tends to include more tropical broadleaf evergreen forest than deciduous woodlands. In the Pacific lowlands region of Western Nicaragua, protected areas are often focused on steeper sloped and higher elevation areas. In this the pacific lowland region, a large proportion of remaining forest is represented in protected areas, yet these are very small compared to the former extent of forest cover in this region. Rates of forest loss are alarming nationally and in some cases even more so at the level of individual protected areas. We hope that making this information will help to focus conservation attention and prudent natural resource decision-making in Nicaragua and other rapidly changing countries.

LANDSCAPE VARIABLES AFFECT NEST BOX SELECTION AND REPRODUCTIVE SUCCESS IN AMERICAN KESTRELS

Susan Willson, St. Lawrence University; Carol Cady, St. Lawrence University; James Chandler, St. Lawrence University; Mark Manske, Adirondack Raptors

The question of how biologists should manage nest box arrays for bird populations that readily nest in erected nest boxes is key for successful maintenance or supplementation of these species. The American Kestrel (*Falco sparverius*) is a human-tolerant falcon species that has experienced population declines across North America. Using 150 pre-existing nest boxes set up on utility poles adjacent to roads, we examined nest box occupancy and nesting success of a population of American Kestrels breeding in St. Lawrence and Franklin

Counties of northern New York State, over one breeding season in 2014. We asked how nest box selection and reproductive success of kestrels may be affected by 1) nest box orientation, both absolute and relative to the road, 2) traffic volume, and 3) land cover type within 564 m (100 ha) and 1 km (314 ha) radial zones centered around each nest box. Throughout June 2014 we checked each nest box for kestrel occupancy and banded chicks that were 2 - 4 weeks old. We banded 170 American Kestrel chicks from 66 nest boxes. Our data suggest that nest box orientation, both absolute and relative, as well as traffic volume, had no significant effect on kestrel selection of a nest box, nor did it affect the nesting success of the selected nest boxes. We utilized a regression analysis equation to predict percent chance nest box selection and success based on particular land cover types within radial zones. Increasing amounts of agricultural row crops significantly and negatively affected nest box selection at the 1 km radial level, while increasing natural grassland cover significantly and positively affected kestrel nesting success at the 564 m radial level. Our results provide strong evidence that although America Kestrels are human-tolerant and seem to nest in a variety of fragmented landscapes, open natural grassland is critical to nest box selection and breeding success for this declining falcon species.

LAY PEOPLE VIEWS OF BIODIVERSITY: A DIVERSITY OF PERSONAL DETERMINANTS BEYOND A COMMON GROUND

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According to the first Aichi target of increasing individuals' awareness toward biodiversity conservation, we were interested in assessing the understanding of lay people's definition of biodiversity. We gathered definitions of biodiversity from 1210 people, collected in 7 different questionnaire surveys in France between 2010 and 2016. We identified to what extend these definitions were consistent to the academic one. We used Moss et al (2016)'s scoring from 1 to 5, this score being attributed to definitions consistent with one chosen academic definition, and identified if the definition mentioned the conservation of biodiversity or not. We first did a semantic analysis of terms used by respondents. We then generated statistical models with sociodemographic factors as independent variables and scores or the mention of conservation issues in the definition as response variables. All included questionnaire source as a fixed effect. From a total of 1065 different terms, 57 % were quoted by one respondent, and 1% (n=11 terms) by more than 100 respondents. The term "species" was the most mentioned, by more than 50% respondents. The given definitions were either descriptive (88%) or functional (12%), i.e., including relationships between humans and biodiversity through action verbs, like "protecting" or "respecting". Overall, the respondents' understanding was consistent with the academic definition (score 3 or more). Young people scored higher but seldom mentioned conservation issues; women mentioned more often conservation issues. Our study revealed a large diversity in the definition of the term "biodiversity" among surveyed people, but with a common ground of terms, mainly linked to the chosen academic definition. However, we showed that biodiversity definition also sometimes includes a normative injunction to act. This innovative result could be linked with biodiversity being often mentioned together with conservation issues.

LIVESTOCK, HUMANS AND PREDATORS AS UPLAND GOOSE (CHLOEPHAGA PICTA PICTA) NESTS' DISTURBANCES

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Intensified land use in agriculture is one of the main causes of global change and biodiversity loss. Ground-nesting birds, such as Upland Goose, are particularly sensitive, as livestock produce the loss of tall grasses suitable for nesting, trampling, and disturbance to the reproductive couple. In overgrazed areas, vegetation is shorter and nests are more visible to predators. Patagonian steppe's main productive activity, where the Upland Goose breeds, is large-scale livestock production. This species has suffered a 67% population decline in the last 31 years and is categorized as vulnerable in Argentina. We monitored its nests with camera traps in Santa Cruz province, in order to study nest disturbances such as livestock, predators or scientists monitoring nests. These disturbances produce involuntary off-bouts which could reduce reproductive success due to eggs remain exposed to predators and get cold or hot faster impacting on

embryo development. We studied off-bouts duration following disturbance and compared it with situations when females leave the nests voluntarily to forage. Livestock sniffed, licked, and nuzzled the female and the nest. Two nests were trampled. Predator (165±72 min, n=4) and human (104±10 min, n=33) off-bouts lasted longer than forage (40±2 min, n=224) and livestock (28±6 min, n=11) off-bouts (Ppredator vs forage=0.01, Phuman vs forage<0.001, Ppredator vs livestock=0.006, Phuman vs livestock<0.001). There was no difference between predator and human off-bouts and between forage and livestock off-bouts (Ppredator vs human=1, Pforage vs livestock=0.53). We recommend to limit or to exclude livestock during the breeding season to reduce disturbance and trampling. Carnivore enclosures would also boost sheldgeese reproduction. We recommend scientists to space nest monitoring as much as possible. Given ecological similarities with the critically endangered Ruddy-headed Goose, these results have a direct implication on its conservation actions.

LOCALLY-GROUNDED CAPACITY DEVELOPMENT FOR EFFECTIVE CONSERVATION

Kristin Douglas, Center for Biodiversity and Conservation, American Museum of Natural History; Suzanne Macey, Center for Biodiversity and Conservation, American Museum of Natural History; Suzanne Macey, Center for Biodiversity and Conservation, American Museum of Natural History; Adriana Bravo, Center for Biodiversity and Conservation, American Museum of Natural History; Nadav Gazit, Center for Biodiversity and Conservation, American Museum of Natural History; Kimberley Landrigan, Center for Biodiversity and Conservation, American Museum of Natural History; Ana Porzecanski, Center for Biodiversity and Conservation, American Museum of Natural History; Eleanor Sterling, Center for Biodiversity and Conservation, American Museum of Natural History

The environmental challenges we currently face require conservation professionals equipped with skills to understand and solve complex problems. Yet opportunities and resources for training in conservation remain limited in availability and scope, and moreover, are not often adapted to local contexts and language. The Network of Conservation Educators and Practitioners (NCEP), a program of the American Museum of Natural History's Center for Biodiversity and Conservation, enhances conservation capacity worldwide by improving access to educational resources and training for undergraduate educators and professional trainers. As part of our strategy, NCEP produces peer-reviewed, open-access, easily modifiable teaching resources ("modules") on a range of conservation topics. Our online database (ncep.amnh.org) has over 160 modules in eight languages; 32 modules are in the Spanish language and were developed together with our partners throughout Latin America. Many modules are adapted to the local context with locally-grounded examples, and recently, we have highlighted four case studies on conservation challenges and solutions in the Southern Tropical Andes in our online journal, Lessons in Conservation. This journal introduces NCEP resources to a wider audience and provides a formal publication platform for conservation educators. As another part of our strategy, NCEP trains educators in effective teaching practices that model realities of conservation practice, and in Latin America, we supported the development of locally-led efforts, such as a Master's and two Certificate conservation programs in Peru. By supporting capacity development and targeting the teachers of conservation students, NCEP expects to have an amplified and sustained impact, as students become the researchers, managers, and decision-makers of the future. Moreover, through local partnerships and context-specific resources, NCEP helps develop local capacity for conservation where it is needed most.

LOCATION, LOCATION, LOCATION: COMPARING SOURCE SINK DYNAMICS OF A GENERALIST AND A SPECIALIST BIRD

Andrew Gregory, Bowling Green State University; Emma Spence, Morton Arboretum

Greater Sage-grouse (*Centrocercus urophasianus*) and Pheasants (*Phasianus colchicus*) are both gallinaceous birds common to the North American rangelands. Rangelands are one of the most threatened ecotypes on Earth due to rampant conversion for agriculture. Both Pheasants and Sage-grouse are frequently cited as both flagship and umbrella species for rangeland conservation. However, these species have very different home range and habitat requirements. For example, Sage-grouse are commonly thought of as being edge sensitive whereas Pheasants are frequently thought of as edge specialists. Therefore, comparing commonalities in landscape attributes associated with source sink dynamics for these two species will likely yield greater insights as to the multifaceted manner in which anthropogenic activities degrade native landscapes. We used lek counts (N=1,183 leks) and brood survey routes (N=87) for the past 22 years in an emerging HotSpot Analysis framework to understand the spatial dynamics of highly productive (sources) and poorly/negatively productive (sinks) across Wyoming and South Dakota for Sage-grouse and Pheasants Respectively. We found a southwestern shift in source areas over time for both species, which typical of climate change forecasting models predicted range shifts for gallinaceous birds.

Source areas encompass <10-25% of the landscape of any given year and <5-18% of the landscape across all 22 years. Both species sources tend to respond favorably to limited cultivated agriculture up to about 8-40%, and landscape composition >60-80% primary habitat was negatively associated with source presence. However, cultivated agriculture at >40% of the landscape reduced suitability, and road density and urbanization were both negatively associated with HotSpots for either species. Our results reaffirm that limited disturbance might be beneficial for to both edge sensitive and edge specialist species, but further research is needed to identify tolerance thresholds.

MAKING CONSERVATION PUBLIC IN MEXICO: WHY AND HOW TO INVEST IN PUBLIC LANDS FOR THE 21ST CENTURY?

Paulo Quadri, University of California Santa Cruz

Despite being one of the most biodiverse countries in the planet and one of the world´s largest economies, Mexico has not developed fully effective institutions capable of protecting its natural heritage that simultaneously deliver significant socioeconomic benefits to its citizens. As in most parts of the world, conservation in Mexico is seen not only as a means to protect biodiversity and ecological processes, but also as an instrument for poverty reduction and development. Nevertheless, until now, there is no evidence indicating that the protected areas system has provided significant local or regional economic benefits. In addition, Mexico is still behind most Latin American countries in meeting the Aichi goals on protected areas coverage. Albeit some important milestones have been achieved in the past decades, the main reasons behind the slow progress and limited success in conservation policy seem to be related to the overwhelming dominance of private land ownership across most of the country, and the lack of direct government investment in public infrastructure in and around protected areas. With only 2% of its territory under public property, Mexico is one of the most privatized countries in the world. This condition may be severely limiting Mexico´s institutional capacity, and its conservation and sustainable development potential. In this presentation, I will briefly discuss my research on the main economic, social, and ecological arguments behind the importance of expanding publicly owned land for conservation in combination with increased direct federal investments. Based on these arguments, I will share some details about a working proposal to create the National Public Lands Trust for Conservation of Mexico using a federal carbon tax as main source of funding. This novel proposal is being spearheaded by a small group of NGO and academia members, however it is crucial that we find broader support both, within Mexico and in the international community.

MANAGEMENT AND CONSERVATION ACTIONS OF THE GIANT OTTER (PTERONURA BRASILIENSIS) IN ARAUCA, COLOMBIA

Angela Alviz, Fundación Orinoquia Biodiversa; Nathaly Trejos, Fundación Orinoquia Biodiversa; Karen Pérez-Albarracín, Fundación Orinoquia Biodiversa

The giant otter (*Pteronura brasiliensis*) is an endemic species of South America, inhabiting remote areas of the Amazon, Orinoco and La Plata rivers, from Venezuela to southern Brazil (Carter et al. 1999). Large rivers that present streams, lagoons, with low slopes and dense vegetation, are the habitats preferred by the species (Ribas et al. 2012). Among these habitats, they are found in gallery and riparian forests that are important elements of the Arauca department. The species is currently classified under the category of Endangered (EN) by the IUCN (Groenendijk et al. 2015) due to habitat loss and poaching pressure because it is considered a direct competition of traditional fishing (Rodríguez-Mahecha et al. 2006). Therefore, throughout the range of the species there are anthropic pressures that condition their survival. Despite the existing information about the giant otter, there are still important information gaps in the Colombian Orinoco in terms of biology and life history, as well as factors influencing the distribution of the species and the demographic behavior of populations. From this and taking into account the information gaps that exist on the current state of the giant otter populations in the department of Arauca, we sought to implement actions of management and conservation of the species through the validation of its distribution, the generation of information on the ecology of the species (foraging ecology and behavior) and the development of environmental education programs with local communities, which led to the elaboration and implementation of conservation and monitoring programs in Arauca.

MANAGEMENT AND CONSERVATION STRATEGIES IN COLOMBIAN ORINOQUIA WITH THE PARTICIPATION OF COMMUNITIES

Carolina Mora, La Palmita Centro de Investigación

The Colombian Orinoquia is a region ecologically, politically, culturally and economically complex. Therefore, regional management for the conservation of the territory is difficult to address. Based on the construction of shared knowledge and the generation of well-being, Fundación Reserva Natural la Palmita articulated a joint work between state entities, private enterprises

and the community. The result was an environmental strengthening community program and the training of local experts. This initiative included local communities from thirty rural districts (veredas) belonging to eight municipalities and two departments. We carried out a socio-environmental diagnosis of these territories to understand how ecosystems are used every day, their transformation and effect on the community well-being. The communities reconstructed their history and with the help of 3D maps they recognized their ecosystems, those sites of special interest to conserve and the problems of their territory. These communities also reflected about the use of the ecosystem services and its relationship with their own well-being. Each community built proposals to solve the problems they identified in their territories and they strengthened those solutions proposed through an exchange of experiences with institutions and researchers. The inhabitants of the Pauto river basin agreed to jointly monitor discharges into the river. The inhabitants of Casanare river formed community committees of environmental monitoring on the state of the ecosystem services in their territory. We generated organizational processes in the communities that transcend the rural districts and municipal borders and thus, they are better adapted to face the environmental issues and to conserve natural resources. We demonstrated the importance of involving local communities in research, because it is possible to bring the scientific results to the territory and to build well-being with a sense of care for the environment.

MAPPING WOODY ABOVE GROUND BIOMASS FOR FOREST MANAGEMENT DECISIONS

Vladimir Wingate, University of Basel

Mapping woody above ground biomass (AGB) is essential for modelling carbon dynamics, quantifying carbon stock changes and forest management decisions. Throughout Namibian savannahs, two vegetation change processes are widespread, yet their spatial and temporal impact on AGB remains little known: 1) deforestation and forest degradation, and 2) the encroachment of the herbaceous layers by woody strata. Both of these vegetation change processes impact ecosystem services and the economic use of the land, for example, for conservation, cattle ranching, and crop farming. This study quantifies changes in AGB over an eight-year period for a region of Kalahari woodland savannah in northern Namibia. Data from 101 forest inventory plots collected during two field campaigns (2014-2015), were used to model woodland AGB with the regression tree-based algorithm (Random Forest), as a function of the Advanced Land Observing Satellite (ALOS) Phased Array L-band Synthetic Aperture Radar (PALSAR and PALSAR-2) and Landsat metrics for 2007 and 2015. The model explained 96% and 91% of the variance for 2007 and 2015, respectively. Results were validated independently using space-born LiDAR derived vegetation canopy height metrics (R2=79% and 72%). We find an overall loss in AGB despite wide-spread regrowth and small-scale deforestation. This is potentially attributable to extensive woody thickening, which is agreement with long-term field observations. This study reveals the spatiotemporal extent of vegetation change processes including deforestation, woodland degradation, woody encroachment and forest re-growth. Knowledge on the spatial and temporal dynamics of these vegetation changes processes are essential in informing conservation and land management decisions as well as prioritizing where management actions should be implemented.

MAZAMA GOUAZOUBIRA GENETIC VARIATION AND PHYLOGEOGRAPHY FOR CONSERVATION STRATEGIES IN URUGUAY

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The Neotropical gray brocket deer *Mazama gouazoubira* (Fischer, 1814) is one of the three Uruguayan native deer species. It is in the category of "Least Concern" by the IUCN (International Union for Conservation of Nature) and is considered an abundant species. However, their populations are decreasing due to anthropogenic activities, mainly due to habitat loss and fragmentation. In order to assess the genetic variability and differentiation between Uruguay populations, we analysed a 115 bp fragment of the mitochondrial DNA Control Region (CR) from 53 samples and 28 samples for 166 pb of Cytochrome b (Cyt_b) from five locations throughout northeast and southeast of Uruguay (Rivera, Cerro Largo, Tacuarembó, Lavalleja and Rocha). The CR sequences showed 23 polymorphic sites and 25 haplotypes, and only one haplotype is shared between individuals from the northeast and southeast, The CR and Cyt_b (concatenated) sequences present 29 polymorphic sites 29 polymorphic sites and 22 haplotypes, and only one haplotype was shared between northeast and southeast localities. The haplotype diversity index (CR Hd: 0.938; concatenated Hd: 0.979) indicates a great genetic variability, mainly within the localities and explains more than the 78% of the genetic variance found (CR Φ_{st}: 0.20, $p < 0.05$; concatenated Φ_{st}: 0.21, $p < 0.05$). However, a

tendency to structuring between northeast and southeast was mostly observed for CR sequences (CR Φ_{ST}: 0.086, p <0.05; concatenated Φ_{ST}: 0.10, p <0.05), which could be related to the different types of native forests present in these areas, with at least one migrant per generation. Our results suggest that this floristic structuring, would not be impeding the gene flow between localities, but could have acted as biological corridor between these populations. These results suggest that populations in northeastern and southeastern Uruguay would behave as a metapopulation, which should be taken into account when implementing conservation strategies.

MEASURING PROTECTED AREA EFFECTIVENESS IN PERSISTING THREATENED PLANTS

Munemitsu Akasaka, Tokyo University of Agriculture and Technology; Taku Fujita, The Nature Conservation Society of Japan; Fumiko Ishihama, National Institute for Environmental Studies, Japan; Taku Kadoya, National Institute for Environmental Studies, Japan

Protected areas are considered as a key tool for conserving biodiversity. For protected areas to surely contribute sustaining biodiversity, measuring effectiveness of designated areas to alleviate exposure and intensity of threat as well as representation provides pivotal guideline. Assessing the effectiveness on respective threats could better inform conservation practitioners, because species with conservation concern are often exposed to multiple threats. Here, we measured effectiveness of nature parks (NPs) on 8 threats, respectively, using a time-series nation-wide distribution data of Japanese threatened plants. We focused on threats [development, pollution, illegal collection, trampling, herbivory, succession, limited distribution, and others] that are recorded on 8636 populations, comprised of 1035 species, and two types of zones of NPs, which differ in regulation strictness (strictly and moderately regulated zones). Overall, populations of threatened plants showed lower local extinction rate inside both types of NPs than outside. For alleviation of threat exposure, populations inside both types of NPs were less exposed to development, and were more exposed to trampling than that outside NPs. Whereas, exposure to herbivory and succession did not differ between populations inside and outside NPs, regardless of zone types. Populations exposed to threats other than development and illegal collections had lower local extinction rate inside strictly regulated zones compared to that outside NPs. Local extinction rate of populations exposed to development and illegal collections did not differ between inside and outside NPs, regardless of zone types. We showed that even if effective as a whole, NPs could differ in effectiveness across confronting threats, and effectiveness to respective threats differ between aspects of the effectiveness. Improving effectiveness on less performed components would better prevent further loss of species.

MEETING BIODIVERSITY CONSERVATION AND DEVELOPMENT NEEDS THOUGH TERRITORIAL PLANNING SCHEMES

Marcela Portocarrero, Instituto Humboldt; German Corzo, Instituto Humboldt; Hernando Garcia, Instituto Humboldt; Olga Lucia Hernandez, Independiente; Wilson Ramirez, Instituto Humboldt

Sustainable development has been thought as an oxymoron and for that reason either conservationists or developers have hardly worked together in initiatives that can meet both objectives in a real and applicable way. Though, the environmental crisis that the world is facing has made these two sectors to join forces towards the conservation of the environment, its biodiversity, ecosystem services and ecological processes, to improve people´s livelihoods as well as to protect the natural resources that make possible a country´s prosperity and wellbeing. Since the past years, Humboldt Institute has been working together with the mining and energy sectors aiming at a more sustainable use of the territory through the understanding of it and its components. Territorial planning guidelines have been given to almost 60% of the continental territory of Colombia, covering the Caribbean, Andean, Pacific, Amazon and Orinoquian regions. Specific strategies have been formulated to companies such as Ecopetrol, Promigas and EPM. Innovation on methodologies for the identification of units of analysis, the probability of collapse of ecosystems and the calculation of conservation targets, arise from these initiatives. At least 57 guidelines for the integral management of territory and its biodiversity are provided. The database supporting this information contains more than 35 variables characterizing the territory (30m x 30m pixels) and giving information on its legal status, strategic ecosystems, integrity and connectivity, ecosystem services and many more. The cartographic results obtained seem to be limited by the potential use that can be given to the database as the basis for a decision support system. The results are now being used by other oil, mining and electricity companies, as well as by the environmental authorities. This constitutes an attempt to contribute to the country´s biodiversity conservation, through the development of a territorial planning scheme.

MERCURY CONCENTRATION IN HUMPBACK WHALES (MEGAPTERA NOVAEANGLIAE) SAMPLED IN ANTARCTICA AND COLOMBIA

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The G stock of humpback whales (*Megaptera novaeangliae*) corresponds to the population that feeds in Antarctica and has the breeding and calving area in the Southeast Pacific. Although this species has been extensively studied, the effects of the exposure to various pollutants that can bioaccumulate and biomagnify in their tissues are unknown. In order to determine the concentration of mercury in humpback whales from the G stock, skin and blubber samples from live whales were collected in Antarctica (2014, n = 15) and in the Southeast Pacific (Coquí, Colombian Pacific) (2015-2016, n = 14). In these samples the concentrations of Hg were measured by atomic absorption spectrometry (AMA-254, Altec). The results of these analyzes revealed significant differences in mercury concentrations by tissue type ($p < 0.05$), with Hg concentrations being approximately three times higher in skin samples (X = 30.1 ± 2.8 μg / kg, n = 22) than in blubber samples (9.4 ± 1.2 μg / kg, n = 14). In addition, it was observed that regardless of sex, Hg concentrations in Antarctic skin samples (35.0 ± 3.7 μg / kg, n = 14) were significantly higher ($p < 0.05$) than in the Coquí skin samples (21.3 ± 1.8 μg / kg, n = 8). The concentrations of Hg in females (34.5 ± 4.2 μg / kg, n = 10) were significantly higher ($p < 0.05$) than in males (23.1 ± 3.8 μg / kg, n = 8), regardless of site, and only in skin samples. This study suggests that whales accumulate more Hg in the areas where they feed than in the areas where they reproduce, probably due to processes of bioaccumulation and biomagnification. Additionally, we proposed that females accumulate more Hg than males, which could have effects on the reproduction and health of the offspring. This study suggests the viability of using skin samples rather than blubber samples to study the spatial and sex variability of mercury accumulation in humpback whales.

METHODOLOGICAL FRAMEWORK FOR THE IMPLEMENTATION OF IMPORTANT PLANT AREAS (IPAS) IN COLOMBIA

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Plants are essential to life on Earth. Unfortunately, nearly two thirds of plant species are under threat, for causes related to human demographic expansion, land use change, deforestation, over-exploitation, invasive species, pollution and climate change. Most countries are committed to have by 2020 at least 17% of their land area under protection, according to the Aichi Biodiversity target 11. However, these areas are often established without the appropriate baseline to maximize the conservation efforts, leaving important species unprotected. To inform conservation plans, a common approach has been the systematic identification of key biodiversity areas (KBA), including Important Plant Areas for conservation (IPAs). The target 5 of the Global Strategy for Plant Conservation aims to have at least 75% of the IPAs in each region protected with effective management in place. However, there is a notable lag in the implementation of IPAs, particularly in some of the most diverse countries. Colombia is arguably the second most diverse country, with 85 general ecosystems and more than 28,000 plant species. Of those, 798 species are in the red list and over 300 are considered keystone species. Currently 13.71% of Colombian continental land is under protection in 640 nature reserves. The government organization responsible for research on biodiversity, the Humboldt Institution, is moving forward to the implementation of IPAs in Colombia. After analyzing various methodologies, a suite of goals, criteria, indicators and methods that fit the interests and needs of the country is now being presented. This methodology, deeply discussed with experts, is based on the general principles of transparence, simplicity, inclusiveness, and coherence. Using ecosystems as units of analysis, it approaches both important species and communities, with no prioritization of criteria. The first implementation is presented here, with the hope of informing future conservation plans for Colombia.

METHODS FOR TRANSLOCATING AND HAND-REARING LAYSAN ALBATROSSES

Charles Kohley, Pacific Rim Conservation; Megan Dalton, Pacific Rim Conservation; Eric Vanderwerf, Pacific Rim Conservation; Lindsay Young, Pacific Rim Conservation

Over 99% of Laysan albatrosses nest on atolls < 3 meters in elevation, where they are at risk from sea level rise. Establishing new high-island colonies is among the highest priority conservation actions for this species. With the goal of creating a new, secure colony, from 2014-2017 we translocated Laysan albatross eggs from the U.S. Navy Pacific Missile Range Facility (PMRF) on Kauai, where the birds nest near a runway and are an air strike hazard, to James Campbell National Wildlife Refuge (JCNWR) on Oahu, where a parcel of coastal land is managed as seabird nesting habitat. We temporarily placed the eggs in an incubator and then with foster parents at Kaena Point

Natural Area Reserve. Hatching rate increased from 23% to 76% as a result of improved incubation techniques. When the chicks were three weeks old we moved them to JCNWR so they would imprint on that location, and raised them by hand until fledging. Chicks were fed 15-20% of their body weight daily on a diet of pureed fish, squid, pedialyte, fish oil, and vitamins. The chicks grew faster and at a more consistent rate than wild chicks measured in parallel with the translocation. To date, 29 of 30 translocated Laysan albatross chicks fledged from JCNWR. We expect these birds to begin returning to the release site in 3-5 years and to start nesting there in 5-8 years. This project represents a successful partnership to accomplish an important conservation action for Laysan albatross while helping to solve a human-wildlife conflict. The methods developed for hatching and rearing albatrosses will be useful in other seabird translocation projects.

MICROHABITAT OF EPIOBLASMA TRIQUETRA (UNIONIDAE) IN THE LAURENTIAN GREAT LAKES WATERSHED

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Epioblasma triquetra, the Snuffbox mussel, is an endangered species due to population declines across its range. Microhabitat data were compiled from 318 (0.25m2) quadrats where Snuffbox were present to determine if variables were consistent among sites in the Great Lakes watershed. Depth, flow, and substrate composition were measured. All quadrats were sampled from nine rivers in the Great Lakes watershed in Michigan, Ohio, Wisconsin, and Ontario between 2012 and 2016. Approximately 85% of the quadrats sampled were collected from the Wolf, Little Wolf, Embarrass rivers of Wisconsin, and the Sydenham and Ausable rivers of Ontario. Principal Components Analyses were conducted to evaluate relationships between parameters and groupings of quadrats by drainage and rivers. We found that depth explained most variation in samples collected from the Wolf, Little Wolf and Sydenham rivers. Depth was removed to determine if substructure existed in the data, the Embarrass River was further characterized by higher water flow and sediments with higher components of cobble whereas the Wolf River exhibited higher amounts of sand both within the Lake Michigan drainage. The Ausable River in the Lake Huron drainage was characterized by higher components of sand and found to have less variation compared to other drainages. Microhabitats in the Clinton, Belle, and Huron rivers in the Lake Erie drainage were best characterized by sediments dominated by sand and silt and the Sydenham River of the same drainage was characterized by higher water flow and higher components of cobble. These data suggest that microhabitat use of Snuffbox may be different among the rivers sampled. The differences observed in habitats used by Snuffbox mussels among the sites sampled in the Great Lakes drainage may be a result of local adaptation which should be considered when management decisions are made about relocation and augmentation for conservation and restoration purposes.

MILKWEED NUMBERS AS A LIMITING FACTOR TO MONARCH POPULATIONS IN TALLGRASS PRAIRIES OF MIDWEST, USA

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The United States Fish and Wildlife Service is considering a petition to list monarch butterflies (*Danaus plexippus*) as a candidate for protection under the Endangered Species Act. The recent plummet in monarch population size has been attributed to the reduction and degradation of prairies in the Midwestern states of the USA. The limiting factor within prairies is presumed to be the number of milkweeds, on which monarchs are dependent from egg through caterpillar life stages. To understand the role of milkweeds and prairies in monarch population growth, we studied milkweed and monarch populations in five tallgrass prairies across the summers of 2015 and 2016. We measured milkweed densities in the prairies and visited a sample of milkweed plants (n=275) twice each week to record the presence of monarch eggs, larvae, and butterflies. Using lifetable analysis, we measured the survival rates of monarchs between their life stages. The density of milkweeds across the prairies averaged 233 plants/ha. Only 21.7% of monarch eggs survived to become caterpillars, and survival rates among larval instar stages were extremely low. None of the eggs and larvae we tracked made it to the chrysalis stage. Our data do not support the hypothesis that the number of milkweeds in Midwestern prairies are limiting monarch populations. The large populations of milkweeds available to monarchs coupled with the fact most milkweed plants were not used by monarchs suggest constraints to monarch populations beyond simple habitat availability. Other limiting factors to monarch populations need to be considered like predation on eggs and larvae, prairie patch size, threats at the overwintering site and along migration routes. The current push to recover monarch populations involves unprecedented levels of funding, collaboration, and multinational habitat restoration efforts. We encourage

managers to continue to explore monarch conservation needs in addition to planting prairie rich with milkweeds.

MODELLING CLIMATE CHANGE'S IMPACT ON GLOBAL VEGETATION USING A TRAIT-BASED APPROACH

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Climate change is expected to have a great impact on the world's vegetation, affecting food security and the supply of natural products. The magnitude of the impact can be predicted using Dynamic Global Vegetation Models (DGVMs). Trait-based DGVMs use plant attributes that are directly filtered by the environment, like plant functional traits, supposedly capturing ecosystems' resilience to disturbance. However, current trait-based models are fitted on community trait means and model plant traits separately, ignoring the importance of trait variability within local plant communities. We developed a trait-based DGVM that incorporates this variation and used it to assess current vegetation dynamics and the effect of climate change. We selected a set of plant functional traits (e.g., height and seed weight) that are key to plant life strategies and vegetation processes. By using a Markov Chain Monte Carlo generalized linear mixed model we regressed trait combinations onto various environmental drivers, based on more than 500,000 globally distributed vegetation records. We then trained a Gaussian Mixture Model to cluster predicted plant trait combinations into global vegetation types. Finally, we projected trait distributions and vegetation types under future climate change scenarios and identified areas where climate change is most likely to modify vegetation. We show that this trait-based DGVM is able to better account for model uncertainty compared to current trait-based models, as a result of including trait variation, more plant functional traits and more environmental drivers. The results of our analysis not only allow a better understanding of global vegetation dynamics, but also contribute to designating conservation areas and redirecting nature management.

MOLECULAR-ASSISTED IDENTIFICATION AND VALUE ASSESSMENT OF BATOID SPECIES AT LANDING SITES IN INDIA

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India is among the top three harvesters of sharks and rays worldwide. Until the 1960's shark and ray fishing was uncommon in India due to little interest in their meat as a preferred commodity. However, a recent surge in demand for shark and ray parts in Asian medicine and seafood markets has driven an unlimited expansion in Indian shark and ray fisheries. The tightening of regulations on shark and ray fisheries in other, top supplier countries like Indonesia, has led to an even greater and unregulated surge in demand for shark and ray fisheries in India. Ironically, there is very little data on Chondrichthyans, one of the most abundant and diverse species found in the Indian ocean. Batoids (rays and skates) are the least studied in this group and also the most speciose. Many ray species end up as incidental bycatch, while others are targeted for their fins and gill plates. Nevertheless, both targeted fishing and incidental bycatch of batoids, is contributing to their rapid decimation. Thus, obtaining species biodiversity estimates for resident batoid populations and investigating Indian fisheries for species distribution among targeted and incidental catches is critical. It is also important to understand the economic drivers of batoid products for commercial and artisanal fishers, and to establish and implement sustainable conservation strategies after assessing stakeholder interests in collaboration with local communities and organizations. Here we describe our study of rays and skates in Northern Gujarat, which is an understudied area for batoid biodiversity, yet is rich in batoid species and supports one of the most prolific shark and ray fishing industries within India. We also describe the use of novel genetic techniques that rely on high throughput and portable sequencing technologies for identification of batoid species.

MONETIZING WILDLIFE HABITAT A NECESSARY EVIL

Shelly Johnson, University of Florida; Damian Adams, University of Florida; Holly K Ober, North Florida Research & Ed Cn

In a market-driven economy, quantifying how the public values wildlife species is essential for building support for management actions designed to promote wildlife habitat conservation. The native range of the longleaf pine ecosystem in Florida, USA – a critical component of the 36th and most recently named global biodiversity hotspot, the North American coastal plain, has been reduced to less than 3% of its former range. We quantified the public's preferences for habitat management, by asking 1164 Floridian residents how much they would be willing to contribute to a State-managed fund, dedicated to habitat improvements, assuming this payment would be added to their household utility bill each month. Ten wildlife species of conservation concern in Florida were included in the survey. We employed a double-bounded dichotomous choice model and each participant was queried on three of the ten species, including one highly-

preferred and one least-preferred. For each species, the participant was initially presented with one of five bid options, ranging from $0.80 USD/month to $6.70 USD/month. Data were analyzed with a logit model in the DCchoice package in R. The average willingness-to-pay of all 10 wildlife species combined was $1.61 USD/month. While charismatic and familiar species had a higher value (e.g., southeastern bald eagle $3.36 USD/month), even generally disliked species had a positive value overall (e.g., eastern diamondback rattlesnake $0.37 USD/month). With over 7 million households in Florida, an extrapolated value would equate to over $156 million USD per year, demonstrating substantial financial support by the public for wildlife habitat improvements. While there is sometimes controversy over the monetization of wildlife habitat, examples such as this cannot be overlooked given their potential impact on policy development and building support for wildlife habitat conservation in regions of conflicting land use.

MONEY MATTERS: FINANCIAL GAPS CONTRIBUTED TO FOREST COVER LOSS IN ECUADORIAN PROTECTED AREAS

Janeth Lessmann, Pontificia Universidad Catolica de Chile; Aaron Bruner, Conservation Strategy Fund; Javier Fajardo, Real Jardín Botánico (RJB-CSIC), España; Pablo Marquet, Pontificia Universidad Catolica de Chile

Worldwide, conservationists have long claimed that inadequate financing for protected area (PA) management is a major threat to effective conservation. However, there is little empirical evidence on the link between PA funding and conservation outcomes. This study addresses this gap in information by evaluating the relationship between funding and forest cover loss within Ecuador´s PAs. In particular, we construct an explanatory model of the percentage of forest cover loss that 27 Ecuadorian PAs experienced during 2002-2011, using estimates of financial gaps as a predictive variable. Financial gap is the percentage of the funds required to meet basic and specific needs for PA management (e.g., adequate staff, equipment, infrastructure) that were not covered by the given PA budget during the assessment years. Additional PA attributes shown by other studies to be related to forest cover loss, such as their geometry (e.g., size, shape) and location (e.g., accessibility, human population density, agricultural potential), were also incorporated as predictive variables. We find that forest cover loss within PAs is best explained by a combination of their location features, along with their financial gaps. Specifically, PAs with greater inadequacy of funds suffered higher percentages of forest loss. This relationship between funding deficits and forest loss was stronger for threatened PAs that are highly accessible or that face significant agricultural pressure. Finally, additional analyses showed that financial gaps were smaller for older PAs, which received a major investment for their infrastructure decades ago. Our results contribute to the understanding of conditions under which PAs in a tropical region deliver conservation benefits for forest protection. Of particular importance, our study offers clear evidence on the necessity of closing PA financial gaps to make them fully effective, in particular where they face major threats.

MONITORING PARROTFISH AS AN INDICATOR OF CORAL REEF RESILIENCE AND FISHERY MANAGEMENT IN THAILAND

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Coral reefs provide a structural complex habitat which can support high biodiversity of marine organisms. Healthy coral reefs are economically valuable ecosystems, providing important ecosystem services. The severe coral bleaching events caused mass mortality of corals in the Gulf of Thailand and have been recognized as one of the negative impacts of global change on marine and coastal ecosystems. The coral bleaching also affects coral reef fish abundance, richness and biodiversity. The loss of live coral cover can have a significant impact on fish biodiversity and abundance. Parrotfish are important members of coral communities as they feed on macroalgae that would otherwise compete with corals. This study investigated spatial patterns of parrotfish abundance on coral communities in the Gulf of Thailand. The parrotfish abundance was observed by using a standard visual census technique in the belt-transects. The high abundance of parrotfish was recorded at certain reef sites in the Western Gulf of Thailand. Many colonies of the massive Porites species complex, the most dominant corals in the Gulf of Thailand, showed a number of parrotfish grazing scars. Our results indicate the importance of parrotfish studies in the Gulf of Thailand, particularly their feeding behavior, population ecology, and relationships with coral community structure and coral recovery processes following major coral bleaching events and anthropogenic disturbances. This study provides baseline data for further studies and management of coral communities and fisheries in the Gulf of Thailand under multi-stressors of global change crisis.

MONITORING TAPIR AND OTHER TERRESTRIAL MAMMALS IN "BAÑADO LA ESTRELLA" WETLAND IN ARGENTINA

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The "Bañado la Estrella" is the third largest wetland in South America and represents a strategic site for its water supply and for this exceptional biodiversity. Tapir (*Tapirus terrestris*) is among of the species of high conservation value and considered endangered in Argentina. Managing the effect of current and further loss of suitable habitat is one of the major challenges, because this cryptic species are the most vulnerable. Their very wide-ranging behavior leads that human populations exist across their distribution and require collaborative conservation efforts. As part of Tapir`s Conservation Project, Fundación Temaikèn, in collaboration with the Production and Environmental Ministry of Formosa, has developed an education program with the local community and a terrestrial mammals monitoring. To monitor and determine medium to large forest mammals habitat associations at a local scale we used 15 remotely triggered camera traps during one year during 2016. We used hierarchical multi-species occupancy models of the detection- non-detection data to estimate occupancy and local richness to determine the relationship with forest class while accounting with imperfect detection. We found that species richness was 18 species, represented by 6 carnivores, 5 xenartha, 4 ungulates, one lagomorpha, one rodent and one marsupial. The mammals' occupancy was ranged from 0.2 – 0.7 and detectability from 0.1 to 0.4. We estimated an average occupancy for tapir of 0.2 [90%CI: 0.1, 0.4]. For rare species such as tapir and giant armadillo models showed that occupancy was higher in lowland forest. Large herbivores such as white lipped peccaries, and giant armadillo are being monitored too. The study reveals the importance of this wetland for the large mammals' conservation and endorse the usefulness of camera trapping to assess communities of forest mammals and determining their habitat associations, providing information relevant to their local conservation management.

MORPHOLOGY AND MORPHOMETRICS OF THE SAGITTAE OTOLITHS OF INVASIVE LIONFISH IN COLOMBIAN CARIBBEAN

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Otoliths are three pair (lapillus, asteriscus and sagittae) of calcium carbonate precipitations, which are part of the inner ear of the teleostei and perform functions of equilibrium and sound detection. Sagittae otoliths are the most studied because of their morphological variability and size. Their shape is influenced by several environmental conditions such as depth, water temperature and other intrinsic factors, thus, the shape of the sagittae is specific for each taxa and may have valuable applications. For invasive lionfish in Colombia they have not yet been described. In the present study, we present a morphological and morphometrical description of the sagittae otoliths. Also, an analysis of its morphometric parameters between two environments of the Colombian Caribbean (Magdalena and Bolívar). Sagittae were extracted, cleaned, photographed (optical) and measured for 231 otoliths (129 belong to Magdalena and 101 to Bolívar). The analysis included shape descriptors used to compare shape between size classes, correlations between length, height and weight of the otolith versus the fish standard length and weight, which were mostly explained by a linear equation. The comparison between left and right sagittae showed no significant difference in otolith weight and length (t-tests, $P > 0.05$) but it did for height. The right otolith was used for multivariate analysis including all morphometrical variables at once and comparing between size classes showed significant differences between environments and size classes (PERMANOVA, $P < 0.05$). This is an evidence of the high plasticity of Pterois volitans, a characteristic that has allowed him to successfully invade Caribbean environments a lot more diverse and contrasting than those which it inhabits in its native range.

MORTALITY, INFANTICIDE, AND JUVENILE SURVIVAL IN FERAL CATS (FELIS CATUS)

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Worldwide, feral cats (*Felis catus*) have contributed to some of the greatest biodiversity losses, and are one of the worst invasive species. This is particularly evident in New

Zealand where native fauna evolved without mammalian predators. There is very little information available on the reproduction of these animals in the wild. By studying the reproductive potential of feral cats, we can predict the possible recovery of the population during or after pest management. Investigating the causes of mortality of kittens will allow us to determine factors naturally limiting the population growth of these carnivores. We studied a population of feral cats on Ponui Island (1770 ha), New Zealand. Nine adult cats (6 male, 3 female) were captured and were weighed, measured, and fitted with radio transmitters from April 2015 to January 2017. Males weighed more on average than females (males = 3.62kg, females = 2.47kg). Twenty-eight motion-sensing cameras were also set up in a grid system over the site to monitor cat movements and detect pregnancies. Kitten dens were found by locating the tagged mother around the estimated due date. The kittens were measured, weighed, and sexed. There was a seasonal trend in feral cat pregnancies; most pregnancies were detected between February and April, with another smaller peak occurring between September and December. Den sites varied from holes in the ground, to shrub, to a tree. Queens moved their litters several times to different dens. One litter of three kittens was weighed and measured for five weeks. Kittens gained between 12-20 grams/day in body weight. From December 2015 to July 2016, two of three monitored litters had no kittens survive to weaning. Kitten survival was estimated to be less than 10%. There were two cases of infanticide observed in this population. This knowledge will help us customize management plans to better control these pests and reduce the damage feral cats cause to native fauna populations.

NATURE AT RISK UNDER FUTURE AGRICULTURAL EXPANSION AND INTENSIFICATION

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Agriculture is a leading driver of biodiversity loss. However, its future impact on biodiversity remains unclear, especially because agricultural intensification is often neglected, and because high path-dependency in agricultural development is assumed - although the past suggests rapid and drastic change occurs frequently. Here, we investigate the full option space of possible future global impacts of agriculture on biodiversity at a 1-km² resolution. Based on an extensive database of local biodiversity responses to agriculture, we find up to 30% of species richness and 31% of abundance potentially lost, mainly due to agricultural expansion across the Amazon and Sub-Saharan Africa. Intensification risk-areas include India, Eastern Europe, and the Afromontane (7% species richness and 13% abundance loss). Many high-risk regions are not adequately covered by conservation prioritization schemes and exhibit low national conservation spending along with high agricultural growth. Considering rising agricultural demand, our results highlight areas where effective land-use planning may proactively mitigate biodiversity loss.

NOVEL DATA ON GERMINATION ECOLOGY OF NATIVE ANDEAN PLANTS APPLIED TO ECOSYSTEM RESTORATION

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Restoring degraded ecosystems has been finally acknowledged as a global priority. However, the scope of restoration practices are often limited by a shortage of theoretical and practical tools to restore biodiversity and ecosystem functions. Such is the case with revegetation practices in the tropics; for the majority of native plant species, basic aspects of their ecology are not fully understood and are seldom documented. Thus, restoration practitioners face the challenge of applying methods and procedures usina a poor knowledge-base and no reference data. In this context, our goal is to investigate and document the germination ecology of native Andean plants that have a potential for revegetation. Here we present imbibition and germination patterns in lab conditions for 15 native species belonging to the families Berberidaceae, Coriariaceae, Cunoniaceae, Ericaceae, Escalloniaceae, Fabaceae, Melastomataceae, Meliaceae, Myricaceae, Proteaceae, and Rosaceae. Seeds of all species were processed within 24 hours of collection to avoid storage effects. Germination data was analyzed separately for each species using survival analysis tests (Kaplan-Meier method). Germination counts for all species ranged between 66 - 98% within 30 days of observation. Some species required pre-germination treatments; e.g., disrupting the testa or endocarp via mechanical scarification and controlled changes in temperature and humidity. For each species we give specific recommendations related to propagation protocols and direct seeding applications. The information presented in this study has not been previously reported in the scientific literature and thus we hope our results help increase the native species pool used for revegetation in the Andes as well as our knowledge of tropical plant ecology.

PARTNERS FOR CONSERVATION IN THE COLOMBIAN AMAZON

Javier Maldonado-Ocampo, Pontificia Universidad Javeriana; Elizabeth Anderson, Florida International University; Juan Ricardo Gomez, Pontificia Universidad Javeriana; Ana Alicia Lemos, Florida International University; German Palacio, Universidad Nacional de Colombia sede Amazonia; Marlon Pelaez-Rodriguez, Universidad de la Amazonia; Trigal Velasquez-Rodriguez, Pontificia Universidad Javeriana

Partners for Conservation in the Colombian Amazon is a platform for collaboration for the conservation, management, and sustainable development of the Amazon region. It includes diverse organizations—government institutions, the private sector, and NGOs—but at its center are four universities: the Pontificia Universidad Javeriana, Universidad de la Amazonia, Universidad Nacional de Colombia sede Amazonia, and Florida International University. Traditionally, research in the Amazon region has been developed by people from outside of the region, and even decision-making about the future of Amazonia has taken place centrally in Colombia. Given this panorama, the question arises: How might institutions of higher education promote processes that strengthen local capacity for decision-making in Amazonia? In this sense, Partners for Conservation in the Colombian Amazon, since 2012 has been working in three specific areas: (1) Strengthening capacity of higher education institutions to offer high quality training programs relevant to conservation and management of Amazonian resources; (2) Strengthening capacity of students and faculty at higher education institutions in Colombia to carry out and disseminate applied research for biodiversity conservation and resource management in the Amazon; and (3) Strengthening the capacity of Colombian universities to collaborate with international scientists, other universities, NGOs, and government institutions in the Amazon.

PERSONALITY ASSESSMENTS AS POTENTIAL TOOLS FOR REINTRODUCTION PROGRAMS

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As populations of endangered species dwindle, captive breeding programs increasingly will serve as reservoirs for genetic and behavioral diversity. As such, reintroductions will likely become integral components of many conservation programs. While reintroductions are associated with important benefits (e.g., formation of new populations, mitigation of inbreeding depression, and re-establishment of demographic structure), success often is low. One factor contributing to post-release failure is that many captive-born animals respond inappropriately to physical and social challenges in the wild. Therefore, methods are needed which allow managers to easily and accurately identify candidates that are suitable for release. Assessments of animal personality, i.e., consistency in behavior over time and across contexts, may better enable mangers to predict how individuals might respond to ecological challenges following reintroduction. Here, developed a simple personality assessment in which we exposed captive golden lion tamarins (*Leontopithecus rosalia*) to novel stimuli (i.e., food and toys). We aimed to determine whether individuals show consistent personalities with regard to investigatory behavior. We also examined whether individuals' responses to novel stimuli predicted other behaviors (i.e., activity levels and anxiety-like behaviors). We found that monkeys exhibited distinct personalities in their responses to novel items. Moreover, those individuals that showed the greatest levels of investigatory behavior, that is, the least neophobic, also were the most active. Investigatory and anxiety-like behavior was unrelated. These findings suggest that simple behavioral assessments can be used to reliably determine personality profiles of captive animals. Ultimately these techniques can be used to inform future selection of suitable candidates for reintroduction, which, in turn, should considerably improve rates of post-release success for many conservation programs.

PHYLOGEOGRAPHY OF THE BLACK-EYED TREE FROG, AGALYCHNIS MORELETII (DUMÉRIL 1853)

Alejandra Zamora Jerez, Manchester Metropolitan University

The black-eyed tree frog is a critically endangered species that inhabits México and Central Amercia. Its populations are rapidly declining due to habitat loss and infectious diseases (Santos-Barrera et al. 2004). Urbina-Cardona & Loyola (2008) determined that only 18.99% of the potential range of this species is protected. Due to the high phenotypic variation within this genera there is debate surrounding the taxonomic status for some of the Agalychnis species (Duellman 2001). This project aims to determine if there are genetic and phenotypic differences between the populations of *Agalychnis moreletii*. In order to do this microsatellite markers are being developed using Illumina sequencing and bioinformatic tools. Buccal swabs samples have been collected in several sites of Central America. For developing the microsatellites 8 samples of *A. moreletii* were used. These were sent for Illumina sequencing at Manchester University. The raw sequence files were analysed for quality and filtered using the bioinformatics tools in the Galaxy Centaurus Server. To search for potential microsatellites the 8 data files were

analyzed using the script Pal Finder (Castoe et al. 2012). The program uses Primer 3 (Rozen & Skaletsky 2000) to design primers for these potential microsatellites. The files were blasted against each other using Fox´s algorithm (2015, unpublished) to obtain the primers that could be found in at least four out of eight individuals sequenced. Microstellite markers have been tested by running PCRs using the Qiagen Type-it Microsatellite Kit. A primer pair was considered as successful if it amplifies at least 3 out of 4 samples and only if it presents one or two clear bands on the gel. The information generated will be used to improve conservation strategies for this species and to determine if the populations should be divided into separated evolutionary units.

POPULATION BIOLOGY, LIFE HISTORY, AND ECOLOGY OF THE ENDANGERED BAHAMA SWALLOW

Maya Wilson, Virginia Tech; Jeffrey Walters, Virginia Tech Univ

The Bahama Swallow (*Tachycineta cyaneoviridis*; BAHS) is an endangered bird species that is endemic to three islands in the northern Bahamas. Very little is known regarding the abundance, distribution or dispersal among islands of BAHS, or the factors responsible for the species' decline. We are assessing the current population biology of BAHS using population surveys and genetic-based methods, and expanding the limited life history data available by locating and monitoring BAHS nests. Preliminary results show that BAHS breed between April and July, laying an average of three eggs in pre-existing cavities, primarily abandoned woodpecker cavities in snags of Caribbean Pine (Pinus caribaea) and utility poles, and holes in cell phone towers and buildings. Bahamian pine forests were heavily logged through the early 1970s; work to date suggests that availability of nest sites limits populations, and reductions in this resource may be responsible for the species' decline. We are conducting surveys of the pine forest and other habitats to assess the availability of cavity-nesting resources across the landscape and constructing a cavity-nest web illustrating species interactions. BAHS appear to rely on West Indian Woodpeckers (*Melanerpes superciliaris*) and especially Hairy Woodpeckers (*Picoides villosus*) to excavate cavities, and compete with secondary cavity-nesters including the American Kestrel (*Falco sparverius*), La Sagra's Flycatcher (*Myiarchus sagrae*), House Sparrow (*Passer domesticus*) and European Starling (*Sturnus vulgaris*). By working with local organizations to facilitate and promote this work, our ultimate goal is to provide information that can be used develop conservation strategies for BAHS and its breeding habitat.

POTENTIAL ROLE OF E. GAMBIANUS IN HABITAT REGENERATION AND MAINTENANCE: EVIDENCE FROM DIETARY STUDIES

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Dietary studies can provide insight into the interrelationships between species and their environment and how different species affect and contribute to their ecosystems. Quantifying the relative use of dietary resources by bats helps in assigning bats to trophic roles and provides insight on how changing land use and habitat modifications affect bat populations. We used analysis of faecal and ejecta samples together with monthly monitoring of fruiting and flowering phenology to describe seasonal variations in food availability and the relative use of dietary items by the fruit bat *Epomophorus gambianus* in a West African forest-savannah transitional zone. Correlation of fruiting and flowering abundance with different phases of rainfall seasons demonstrated that flowering abundance occurred with rainfall of the same month (r=-0.644, p=0.002) or a month after rains (r=0.11, p=0.005) whereas fruit abundance was correlated with rainfall of the previous two months (r=-0.614, p=0.003). A total of 35 species of plants belonging to 17 families were identified to be utilized as dietary sources for *E. gambianus*, including some pioneer species, early succession plants, and some species of economic value. Of the 1503 faecal and ejecta samples collected over the 2-year period, *Ficus sp.* were dominant, accounting for 40.6% of all samples, suggesting its importance in the diet of *E. gambianus*. Flower resources contributed up to 79% of the total diet of *E. gambianus*, particularly in the dry "lean" fruiting seasons suggesting its use for major subsistence rather than as a supplementary diet. This highlights the potential role *E. gambianus* plays as a pollinator and seed disperser in contributing to the maintenance and regeneration of the natural forest vegetation especially in the midst of current habitat loss and forest degradation.

PRIORITIES FOR CONSERVATION OF FRESHWATER FISHES IN THE ANDEAN ORINOCO IN COLOMBIA

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The Andean Orinoco basin in Colombia has been severely affected by the anthropic impact in the basin. Although prioritization efforts have been done in important areas for conservation that have included freshwater fish, they have

only taken into account variables of richness, endemic, and threatened species that are insufficient to represent the geographical variability and the distribution patterns of species. In this work, an approach that integrates the identification of areas of endemism, complementarity and risk is implemented, in order to prioritize areas for the conservation of fishes in the Andean Orinoco, and to compare with current protected areas. The three prioritization approaches recovered the Ariari and Guamal river basins as priorities for the conservation of the fish fauna, allowing both high resolution and support for the importance of these areas. The Ariari River basin, along with the Guayabero River compose the upper Guaviare River, one of the most unique regions of Colombia for its rarity and richness of endemic species. Although 47.07% of the Andean Orinoco belongs to some type of protected area, only 0.97% and 14.8% of the fish records come from national and regional protected areas, respectively. This suggests that the ichthyofauna of protected areas is little known and is not represented in the biological collections of the country. Therefore, it results urgent to increase knowledge of the fishes that inhabit currently-protected areas and to include aspects of the society-nature relationship in prioritization to further focus and optimize conservation efforts.

PRIORITISING CONSERVATION AREAS FOR PRIMATES IN FRAGMENTED LANDSCAPES AT COLOMBIAN LLANOS

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Most of the threatened primate species live in fragmented landscapes composed of agriculture, forest patches and human settlements. The spatial configuration and composition of these landscapes have important influences on the spatial distribution and persistence of primate species. However, only until recently has there been an incorporation of landscape level planning and systematic conservation planning for primate conservation. The aim of this paper is to assess conservation area priorities for primates in a highly-fragmented part of the Colombian Llanos, and evaluate the shape of the trade-off between cost and primate abundance targets across alternative cost surrogates. We used the conservation planning software Marxan (v. 1.8.10), to prioritise conservation areas while meeting a representative target of primate species abundance at a minimal cost in a highly-fragmented area. We found that although the shape of the relationship between cost and targets is similar for the costs analysed (i.e., area, inverse distance to nearest town and the combination of both), the conservation target was achieved at a lower relative cost by using the combination cost compared with areas and inverse distances to the nearest towns. In addition, each cost structure showed a different spatial arrangement indicating the sensitivity of conservation priority to cost assumptions. For the study region considered here, the north-east and south-east parts of the study region, that concentrate a good proportion of the selected fragments, seems to be the zones in which primate conservation need to focus.

PRIORITIZING SPENDING ON US ENDANGERED SPECIES RECOVERY PROGRAMS WITHIN INSTITUTIONAL CONSTRAINTS

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Deciding how to allocate scarce financial resources for biodiversity conservation is a problem faced by governments, NGOs, and IGOs alike. Considerable theory and a number of tools have provided guidance on how to best make these decisions, but implementation of the theory has proven more difficult. The Project Prioritization Protocol (PPP) is an allocation strategy that uses information on the cost, benefit, and feasibility of actions to guide decisions. It has been successfully developed for use in New Zealand and several Australian states but common hurdles to uptake include uncertainty on how to apply the theory when agencies have complex institutional structures, as well as a perception of insurmountable data and analytic requirements. The US Fish and Wildlife Service (FWS) is responsible for orchestrating US Endangered Species Act recovery in the USA, where allocation decisions are made within a hierarchical organizational structure. Here we explore trade-offs in future appropriations by using the PPP to run scenarios for FWS recovery spending while accounting for institutional constraints. We provide a demonstration of how estimated changes in species protection can be examined across different scenarios using a dynamic display tool. Using these scenarios, we discuss how the cost-effectiveness approach can be used to examine the implications of changes to agency budget or mission and what strategies could be used by the agency to better reach their goals within

constraints. We conclude that a clear benefit of such an approach is to provide a common language for managers and administrators within the agency to use when communicating about upper-level allocation decisions, both vertically and horizontally within the organization. The findings and conclusions are those of the authors and do not necessarily represent the views of the U.S. Fish and Wildlife Service.

PRIVATE NATURE RESERVES: CHALLENGES AND STRATEGIES FOR CONSERVATION IN THE ECUADORIAN ANDES

Yolanda Chavez, Fundacion Tangare

The management of natural resources is often overshadowed by the need to address critical social issues such as poverty and inadequate governance. As with other Latin American countries, the economic model of Ecuador is primarily extractive, with protected areas often being the main target, as they are usually the most resource-rich regions. This results in conflicting priorities between the conservation and the exploitation of forests. To remedy this land-use conflict, the Ecuadorian government has implemented economic incentives for the conservation of private nature areas. However, as these funds often do not meet the basic needs of landowners, there is a general tendency to convert forests to agricultural land. Nevertheless, we have identified several projects that have succeeded in preserving nature as a means to alleviate poverty. We present the case of La Hesperia, a private nature reserve located at the southwestern slopes of the Andes in Ecuador. The reserve has helped protect the Ecuadorian cloud forest for almost 20 years. By using direct observation, means of verification and three different criteria as indicators of sustainability, we evaluated the successes and challenges experienced in the creation and management of La Hesperia. Our results show that eco-friendly productive activities (e.g., organic agriculture, silvopasture), and educational tourism have been the most effective initiatives to achieve forest conservation and financial sustainability. We aim that this case study helps private reserve managers, policy and decision makers to set frameworks and strategies that enable private reserves in Ecuador to enhance their economic and environmental contribution to society.

PROMOTING CO-EXISTENCE OF JAGUARS AND PEOPLE IN SOUTHERN BELIZE THROUGH A HOLISTIC APPROACH

Karla Hernandez Aguilar, Ya'axché Conservation Trust; Marchilio Ack, Ya'axché Conservation Trust; Said Gutierrez, Yaaxche Conservation Trust

Belize is a critical component of the regional Jaguar Corridor, however jaguars in this area are threatened due to habitat loss and fragmentation resulting from human development and increased agricultural expansion for subsistence. As communities expand their agricultural developments, they move further into traditional jaguar habitat whereby contact and conflict between humans and jaguars becomes more frequent. Lack of knowledge of alternative mitigation measures has led farmers to use lethal control against any jaguars that are in the vicinity of their farms. Underreporting of jaguar attacks also poses a major challenge since it prevents authorities from providing technical support and advice and prevents the application of conflict mitigation measures. Managing organizations such as Ya'axché Conservation Trust (YCT) have been able to strengthen relationships with cattle farmers to encourage them to make reports so that suitable measures can be implemented. These relationships have led to the creation of a National Response Network allowing stakeholders to collaborate and share resources. Since 2014, YCT has focused on building a successful network to prevent inaction and have better coordinated efforts to protect the threatened jaguar species. These efforts have revealed the willingness of farmers to look at alternative measures instead of killing the jaguars by providing them with technical support and advice to implement measures on their farms. As a result, there are now two demonstration farms that have implemented several mitigation measures, that have worked incredibly well in discouraging jaguars from entering their farms and serve as a model for other farmers to view. Additionally, in 2017, we have introduced the use of innovative SMART technology to create a data model to report jaguar attacks. Results obtained during this years have proved to people that both farmers and jaguars can co-exist through a correct implementation of mitigation measures.

PROTECTING TIGERS: THE ZOOLOGICAL SOCIETY OF LONDON'S APPROACH TO TIGER CONSERVATION ACROSS ASIA

Angela Yang, Zoological Society of London (ZSL)

Asia is the world's largest continent, with natural landscapes ranging from the Himalayas to the tropical jungles of Southeast Asia. It is also a continent of immense change. The Zoological Society of London (ZSL) works across the region to build capacity and monitor flagship species, such as tigers. Our in-situ landscape conservation work is defined by a holistic approach where we engage people, ranging from local communities to government to international corporations, minimizing human impacts and ensuring sustainable co-existence with nature in an increasingly crowded world. Wild tigers, one of the Earth's

most iconic species, number less than 4,000 in the wild--an alarming figure that represents less than 4% of the 100,000 animals that existed at the beginning of the twentieth century. In the same period, tigers have lost 93% of their historic range. Globally, this catastrophic population decline has been driven primarily by the loss and fragmentation of tiger habitat, the illegal wildlife trade, human-tiger conflict, and overhunting of prey species. ZSL currently works on the conservation of four of the six living tiger subspecies in our landscapes: Indonesia - Sumatran tiger, Nepal/India - Bengal tiger, Thailand - Indochinese tiger, Russia - Amur or Siberian tiger. This poster will present the range of ZSL activities that embrace our "landscape approach" with overarching themes of capacity-building and monitoring. We will highlight the universal tools and technologies that we use across Asia, such as the Spatial Monitoring And Report Tool (SMART) and education and awareness raising with communities that share tiger habitat, as well as featuring activities that are adapted to specific situations. Tigers are essential to the healthy ecosystems that we all rely on. Through ZSL's holistic, sustainable approach to conservation, we are helping to create a better future for biodiversity and people.

QUANTIFYING POST-WAR VEGETATION CHANGE ON THE NORTHERN UGANDA LANDSCAPE

Nicholas Dowhaniuk, University of Florida; Joel Hartter, University of Colorado

The war in northern Uganda between the Lords Resistance Army (LRA) and Ugandan Government highly impacted the population and land cover of the region. The conflict occurred between 1986-2006, during which time people in the region sought refuge to Internal Displaced People Camps or were forced to migrate to other areas of the country. This displacement and depopulation of rural areas led to an increase woody vegetation by 85% between 1985 and 2002. We used satellite imagery to estimate the change in woody vegetation for the entire period of conflict and post-conflict to 2013 to understand how the northern Uganda landscape has changed since the end of the conflict in 2006. We compared changes in woody vegetation within and among districts, forest reserves, national parks, wildlife reserves, and heavily settled rural and urban town council boundaries. Additionally, interviews of residents and government officials were used to understand the impact of post-conflict regrowth on human livelihoods and land-grabbing in the area. Our results show a widespread loss of woody vegetation in most of the districts in northern Uganda, wit regrowth of woody vegetation in central and local forest reserves, as well as parks and wildlife reserves. Woody vegetation has continued to decrease around the towns and cities of northern Uganda. We connect multiple drivers of woody vegetation loss through our interviews and satellite analysis, including land-grabbing by foreign investors for large-scale agricultural production and oil development in the region. Conflict plays a significant and often underappreciated role in landscape level conservation, and this research exemplifies the progression of change in an area of high biodiversity on multiple scales before, during, and after active conflict. This research provides context on which management and government officials can better manage complex post-conflict situations in the future.

QUO VADIS CAMERA TRAP RESEARCH? A 50-YEAR REVIEW OF CAMERA TRAP RESEARCH GOALS AND OUTCOMES

Izabela Stachowicz, Instituto Venezolano de Investigaciones Científicas; José Ferrer Paris, Ivic

Recent explosion of camera trapping (CT) studies represents a great experiment and challenge in modern wildlife survey methodology. CT has successfully complemented and sometimes replaced various survey methods. We wanted to evaluate different applications and outcomes of research that have used CT in different parts of the world, and how its advantages and disadvantages have changed over time, in order to provide some insights about the future of CT studies for the conservation of species. Three historical periods were covered: 1956-1997 (from a previous review), 1998-2008 and 2009-2016 (until July 2016). The objectives of CT studies were classified into two categories "science", including studies on population parameters (distribution, density, presence, occupancy and abundance), methodology, forest ecology, behavior and activity patterns, and "conservation" with subjects: management, human conflicts and human disturbance, elusive and endangered species, habitat fragmentation, hunting and inventory. The number of CT studies has increased abruptly from 2,63 papers/year in the first period, to 120 papers/year in the last period. Most CT studies have a scientific perspective focused on population parameters, behavior and activity patterns and methodology, but conservation applications with leading topics like management, conflicts with human and human disturbance or habitat fragmentation, are increasing from less than 1% to 16% in these time periods. Currently the majority of CT studies are conducted in Asia and South and Central America, mostly in Brazil, Mexico, and India. Since the 90's mammals have been the primary subjects in 90% CT studies, with special attention paid to big carnivores - umbrella species that attract public attention necessary for conservation action. Studies with multiple objectives and

multiple taxa become more common in the last decades, as complexity of research has increased in order to address current conservation problems.

RARITY AND RESOURCE AVAILABILITY FOR INSECTIVOROUS MAMMALS

Rachael Collett, The University of Queensland

Many tropical species have small range sizes, low population densities and an increased extinction risk. Chris Johnson's 1998 hypothesis is that this is ultimately caused by scarce resources in the tropics. Three high elevation species from the carnivorous marsupial genus Antechinus seem to follow a similar trend (*Antechinus arktos, Antechinus argentus* and *Antechinus godmani*) are listed under threatened species legislation, while low elevation and temperate Antechinus species appear to be common. We aim to test whether low latitude and high elevation species have small ranges and low population densities due to reduced foraging efficiency, by studying Antechinus and their arthropod prey in Queensland, Australia. To determine the population densities and distributions of Antechinus species at different elevations and latitudes, we live trapped over elevational gradients at four mountains at different latitudes of the Great Dividing Range in Australia. To assess arthropod availability for Antechinus we conducted long-term arthropod monitoring at these same sites using short focal distance, programmable time-lapse cameras. This camera trapping method is an alternative to pitfall trapping to collect long-term data on prey availability for ecological studies. The cameras can be left in place for several months, they are non-lethal and do not deplete arthropod populations over time, they are inexpensive in terms of labour and field costs and they solve taxonomic sampling biases associated with pitfall trapping. Initial results show that Antechinus species at high elevations and in the tropics have lower population densities and smaller distributions than adjacent, lower elevation and more temperate species. Overall food availability was lower at high elevation and low latitude sites where rare Antechinus species were found, supporting the idea that resource scarcity is associated with rarity in insectivorous mammals.

RED LIST OF ECOSYSTEMS IN PARAGUAY: A NATIONAL ASSESSMENT FOLLOWING IUCN CRITERIA

Viviana Rojas Bonzi, Guyra Paraguay; Hugo Cabral, Guyra Paraguay; José Ferrer Paris, Ivic; Marianela Velilla, Guyra Paraguay; Alberto Yanosky, Guyra Paraguay; Irene Zager, Provita

For the last five years, several national Red List Ecosystem Analysis have been developed in Latin America through national initiatives. Here we present the results of two years of work in developing and evaluating the Red List of Ecosystems for Paraguay. After a preliminary workshop held in Paraguay in 2015, sixteen preliminary ecosystems were defined for the country and their level of threat was assessed using the IUCN Red List of Ecosystems criteria. Of the sixteen ecosystems, seven were classified under some level of threat: one was classified as Critically Endangered (CR), four as Endangered (EN) and two as Vulnerable (VU). The major threat identified for each is the rapid loss of original cover (Criteria A) due to agriculture and cattle ranching, leading to over 80% of forest loss in the past 50 years for the critically endangered ecosystem. In order to further evaluate the preliminary results, a second workshop will be held in Paraguay to reassess the ecosystem boundaries, threats and categories leading to the official Red List of Ecosystems for Paraguay. Furthermore, we also present the challenges of integrating regional and national efforts to advance towards a global assessment of the world's ecosystems by 2025.

RED-EDGE VEGETATION INDICES AS A DIRECT MEASURE OF HABITAT QUALITY FOR MAGELLANIC WOODPECKERS

Gerardo Soto, Cornell Lab of Ornithology

Accurate estimates of the quality and quantity of remnant habitats is critical for planning management activities for the conservation of threatened species. Although habitat quality usually is understood from a multidimensional niche space approach, the availability of foraging substrates can be a suitable and more proximate index of habitat quality for species with specialized habitat requirements, like woodpeckers that feed almost exclusively on larvae of wood-boring beetles in the trunks and branches of infested trees. Recent approaches use simple mathematical algorithms on spectral bands called Vegetation Indices (VI) to identify infestations, providing a new opportunity to assess habitat quality for woodpeckers. In this work, we tested the ability of 102 VI to estimate tree attributes explaining habitat quality for Magellanic woodpeckers for its usage as a reliable foraging habitat quality estimator. We hypothesized that space use of Magellanic woodpeckers is positively associated with the spatial distribution of decayed trees in the landscape. First, we mapped individual Nothofagus trees based on estimates of species composition from a supervised classification procedure, VI estimates and image segmentation. Second, we selected the best VI predicting the tree quality for Magellanic woodpeckers. Third, we tested these habitat quality predictors, the species

composition and tree age, by using two Synoptic Models of Space Use (SMSU) of Magellanic woodpeckers based on very high-frequency (VHF) radio-telemetry and global positioning system (GPS) telemetry data. Generalized Linear Mixed Models (GLMM) showed that the VI that best predicted habitat quality at the tree-scale was the Plant Senescence Reflectance Index (PSRI, computed as [Red-Blue]/Red-edge), included in almost all the most parsimonious models. The most parsimonious SMSU included only PSRI a

REDUCED ANTHROPOGENIC BURNING LEADS TO LOSS OF GRASSY FORESTS AND DECLINE OF A THREATENED BIRD

Elizabeth Tasker, NSW Office of Environment & Heritage

The fertile volcanic landscapes of the Border Ranges in eastern Australia have experienced major changes over the past century and a half, following European colonisation and subsequent changes in exploitative and agricultural industries. The dominant vegetation is sub-tropical rainforest, which forms a complex matrix with tall eucalypt forests and open grassy forests. Since the 1960s anthropogenic burning has declined significantly as a result of expanded conservation reserves, increasing regulation and a belief that fire is always bad. The result has been a substantial decline in the extent and condition of native grassy forests, and their dependent native biota. The latter include endangered species, such as the Eastern Bristlebird (*Dasyornis brachypterus*) and Hastings River Mouse (*Pseudomys oralis*). The northern population of the Eastern Bristlebird is only found in these grassy forests. Its population has plummeted 80% in the last 40 years, with only 30 individuals thought to remain. The best habitat for this species is now on private property where burning has declined less than in national parks. We carried out experimental burns in grassy forests sites tagging 'problem' plants and assessing their post-fire survival and recruitment. Experimental burns may either decrease slightly or massively increase the abundance of problem plants. This appears to depend on the length of the longest previous inter-fire interval. Our results suggest that a single long interval allows invasive species to escape the 'fire trap' and become established. Once established, most either vigorously re-sprout or germinate from soil seedbanks after a subsequent fire. Whilst grassy forest sites in good condition can be maintained by fires at 3-6 year intervals, sites that have been invaded will require additional measures to restore them to a grassy state where fire alone can maintain them. We are now working with local landholders and park managers to implement appropriate fire regimes.

REDUCING ILLEGAL FISHING USING BEHAVIOR CHANGE INTERVENTIONS

Jose Fraire, Environmental Defense Fund de Mexico; Willow Battista, Environmental Defense Fund

Human behavior is the single most significant driver of environmental change impacting our planet today. Understanding why people behave as they do can allow us to design interventions that encourage more sustainable decisions and actions, and increase the efficacy of new and existing conservation initiatives. One example is illegal fishing, a serious problem that threatens the sustainability of fisheries around the world. Historically, fisheries managers have attempted to increase the costs of illegal fishing through imposition of stricter sanctions and improvements to enforcement programs. Non-monetary factors also influence illegal fishing behaviors, and failing to address them can undermine the efficacy of an otherwise well-designed fishery management system. Furthermore, in many of the world's fisheries, strong and reliable monitoring and enforcement has proven to be an elusive goal. In such cases, interventions designed to address the social, moral, and cognitive drivers of illegal behavior can potentially supplement conventional deterrence methods. Building on insights from the behavioral sciences, we developed a process for designing interventions aimed at strengthening social incentives and psychological motivations for complying with fishery regulations. This process begins with an in-depth stakeholder characterization exercise. Potential interventions that may disrupt undesirable beliefs, norms, and modes of thinking, along with those that encourage behaviors that support the objectives of the fishery, are then developed. Experimental testing is conducted prior to piloting and, finally, scaling of the resulting intervention(s). We present the current application of this process in a fishing community in the Upper Gulf of California, Mexico, where illegal fishing is a pervasive problem that jeopardizes the health of the region's marine ecosystems, as well as the well-being of the community members who depend on them.

REGIONAL SPATIAL ANALYSIS: A TOOL TO REDUCE IMPACTS ON BIODIVERSITY FROM INFRASTRUCTURE PROJECTS

Sebastian Valdivieso, Wildlife Conservation Society; Jorge Celi, Universidad Regional Amazónica IKIAM; Francis Ordonez, Wildlife Conservation Society; Galo Zapata-Rios, Wildlife Conservation Society Ecuador Program

Infrastructure and natural resource extraction projects have the potential to produce irreversible negative effects on biodiversity and ecosystem services. Several of these

negative effects could be addressed at early stages of these projects, such as conceptual development, feasibility analyses or project site selection, with appropriate early spatial analyses. Unfortunately, spatial analyses are often performed at a project level and do not consider relevant biodiversity information, making difficult for decision makers to effectively address, at an appropriate scale, the risk of loss of biodiversity and ecosystem services. To reduce these risks on biodiversity, we propose the development of a set of maps that reflect environmental sensitivity at the regional or landscape level. We tested this methodology in the upper Napo River basin of Ecuador. The maps we generated came from three sources of information: 1) conservation status, 2) ecosystem services and 3) human threats. The sources of information were developed considering the most reliable sources and the scales that best fitted the objectives of the analysis. To define the conservation status, we used spatial information of terrestrial and aquatic ecosystems, habitat suitability models, and land use change. For ecosystem services we used above-ground carbon stock, terrestrial biological resources, aquatic biological resources and productivity of aquatic ecosystems. And for human threats, we used cumulative impacts from roads, oil and mining concessions, demographics, hunting and deforestation. Final maps are a spatial representation of the conservation priorities for the area and provide information regarding the location and the relative importance of natural areas. With this information, environmental and regional authorities can make better and more informed decisions, especially during the early phases of a project, reducing the risk of loss of biodiversity and ecosystem services.

RESTORING BIODIVERSITY USING MAMMAL-FREE SANCTUARIES: IMPLICATIONS FOR BIRDS AND SEED DISPERSAL

Sara Bombaci, Colorado State University; Liba Pejchar, Colorado State University

Invasive mammal predators are a leading threat to island biodiversity globally. Many of New Zealand's birds are declining or extinct due to predation and indirect impacts from invasive predators, which has reduced the availability of dispersal agents for bird-dispersed plants. In a bold response to these concerns, New Zealand has built an extensive network of 'mammal-free sanctuaries,' which exclude non-native mammals with 'predator-proof' fencing, and provide opportunities to conserve native birds. Yet some have questioned whether these sanctuaries are a cost-effective conservation strategy, and the degree that New Zealand's sanctuaries have restored birds and bird-mediated ecological processes is virtually unknown. We used New Zealand's unique sanctuary network to address the following research questions: 1) Do mammal-free sanctuaries enhance the diversity of bird communities and the density of native bird species relative to unprotected areas?, and 2) Do mammal-free sanctuaries enhance bird-mediated seed dispersal relative to unprotected areas? We compared measures of seed dispersal and the density and diversity of bird species in sites where predators have been eradicated to sites where predators are not controlled. We found higher densities of 9/11 native bird species in sanctuaries compared to reference sites; yet all 7 non-native bird species have similar densities between sanctuary and reference sites. Furthermore, fruit consumption and seed dispersal by birds was higher in sanctuaries for some native tree species. Our research provides the first landscape-scale evidence that mammal-free sanctuaries, which require a substantial investment of conservation funds, are meeting ecological objectives. Mammal-free sanctuaries are now being employed or considered as a conservation strategy wherever biodiversity hotspots are threatened by invasive predators; thus, our findings are relevant to the conservation of native species assemblages in New Zealand and beyond.

REWILDING CLEARCUTS: A CHALLENGE TO BIODIVERSITY CONSERVATION IN FORESTRY LANDSCAPES

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The replacement of native forests by monoculture plantations of exotic species is a threat to biological diversity. Enhancing the structural complexity of understory vegetation may improve the habitat quality for wildlife inhabiting landscapes dominated by monocultures of Monterrey pine. However, sustainable management may be difficult to achieve because these monocultures are managed under a clear-cutting system, where the understory vegetation is damaged by harvesting and herbicide application. We hypothesized that an early development of spontaneous vegetation growing along planted Monterey pine seedlings promotes the recolonization of forest species to harvested areas. We analyzed the abundance as well as likelihood to move into and within clear-cut stands of forest animal species (a rodent: *Abrothrix longipillis*; and a ground-dwelling bird: *Pteroptochos castaneus* and insect: *Ceroglossus*

chilensis). We expected clear-cut stands with dense accompanying vegetation are used as an alternative habitat and do not function as movement barriers for these species. Although all three species tended to be reluctant to enter into clearcuttings, their displacement into them was positively influenced by the cover of spontaneous vegetation. In fact, this vegetation was the main predictor of their abundance in native forest, mature pine plantations and clear-cut stands. The conservation of forest species in landscapes dominated by commercial stands of Monterrey pine is fostered by ensuring the rapid development of the accompanying vegetation. Thus, the traditional clearcutting system should be modified through minimizing the use of herbicides and soil impacts while promoting the establishment of understory vegetation.
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SCIENCE BASED ECOTOURISM ON FIVE TROPICAL ARBOREAL SPECIES: DETECTION RATES AND RELATED VARIABLES

Yoonjung Yi, Ewha W. University; Amael Borzee, Seoul National University; Jae C Choe, Ewha W. University

Most traditional communities rely on environmental resources to live, yet through exploitation rather than conservation. Eco-tourism is an alternative, however careful planning for visitor attraction and resources management is required. We thus assessed the encounter probability for five arboreal species in Citalahab area in Gunung Halimun-Salak National Park, Indonesia, where eco-tourism already exists, albeit without proper ecological purpose. We investigated detection rates, relation between species, and relation with environmental variables on Javan gibbons (*Hylobates moloch*), Java leaf monkeys (*Presbytis comata*), Javan langurs (*Trachypithecus auratus*), Javan black giant squirrels (*Ratufa bicolor bicolor*) and black-striped squirrels (*Callosciurus nigrovittatus*). We collected GPS coordinates of observations while following existing trails of different length (i.e., non-linear transects) to represent the movement of visitors. Minimum and maximum temperatures and precipitation were recorded. Over 206.83 hours, we encountered *C. nigrovittatus* 49 times, *P. comata* 24 times, *T. auratus* 24 times, *R. b. bicolor* 24 times and *H. moloch* 23 times. Detection rate per hour was highest in *C. nigrovittatus* (0.32) and the lowest in *P. comata* (0.13). The distance between individuals was high for *T. auratus* (228.1 m) and *H. moloch* (218.25 m), while it was low for R. b. bicolor (168.7 m) and *C. nigrovittatus* (166.29 m). The number of detection for *H. moloch* and *T. auratus* were correlated. General Linear Model revealed *P. comata* had a higher probability of detection at higher minimum temperature, whereas the others did not exhibit any significance. These results enable tour guides targeting specific strategies to set up a specific and effective strategic program through better understandings on the species. Consequently, it will maximize the encounter probability of wildlife with the least disturbances on nature ultimately benefiting both human and the environment.

SELECTING INDICATOR SPECIES FOR BIODIVERSITY MANAGEMENT

Prue Addison, University of Oxford; Payal Bal, University of Queensland

Indicator species are frequently proposed to inform biodiversity management, but whether they are selected under clear management objectives or evaluated for their ability to improve decisions remains unclear. We review the scientific literature to assess if methods used to select indicator species account for key monitoring and management decision factors such as objectives and their constraints, actions, uncertainties and biodiversity outcomes. We find that most indicator selection studies focus on improving the monitoring efficiency rather than the management effectiveness, potentially leading to ineffective indicators. Only 21% of studies explicitly accounted for the management objectives and actions. More worryingly, 94% of studies and half of all indicator selection methods overlook constraints (e.g., budget) and uncertainties (e.g., in detection or management effectiveness). To improve indicator selection for management decision-making, we recommend clearly defining the management context for monitoring, developing practical methods focused on improving management outcomes, and incorporating uncertainty into the selection process.

SERPENTINE VEGETATION DYNAMICS CONIFER AND ENCROACHMENT IN CONJUNCTION WITH ANTHROPOGENIC DISTURBANCE

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The biological and evolutionary significance of serpentine habitats has long been recognized due to the unique endemic flora and high biodiversity. We investigated the coevolution of biotic and abiotic variables in association with anthropogenic factors where multifaceted drivers are accompanying afforestation on native serpentinite grasslands of the Mid-Atlantic, USA. We use an integrated dataset combining plot spatial data, chronostratigraphic data, including mining related Cr concentrations, combined with temporal data from dendroecological tree cores to evaluate vegetation dynamics. Woodland vegetation history was inferred by depth profiling using stable carbon isotopes. Increasing Ψ3C isotopic signatures

in forest soils from -27‰ (0-5 cm) to -22‰ (10-15 cm) and in the ecotone areas Ψ3C signatures vary from -19‰ (0-5 cm) to -17‰ (10-15 cm). Differences in vegetation dynamics were observed with an increase in woody floristic richness with progression from the grasslands. Dendrochronology and plot stem density data suggests poor recruitment of xeric species and concomitant increase in more mesic species. We suggest that chromite mining disturbance during much of the 19th century contributed to soil erosion and/or maintenance of thin, sterile soils too shallow for significant Pinus growth. Shortly after mining ceased around 1880, Juniperus could have invaded the slopes first as soil depth increased. Differences in bulk density, soil depth, heat load, incident radiation and trace element data significantly correlate with a unique historic C4 dominated grassland that has become afforested and the woody species community is transitioning from xeric to mesic conditions. The importance of soil depth suggests that fire and pine clearance alone may not be sufficient to restore conditions favorable to less competitive, herbaceous heliophytes. This ecosystem, which took centuries to millennia to evolve, appears to be evanescing in a manner of a few decades.

SHELTERWOOD IMPACTS ON UNDERSTORY ALONG 50 YEARS AFTER HARVESTING IN NOTHOFAGUS PUMILIO FORESTS

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Nothofagus pumilio forests have been managed by shelterwood cut since early twentieth century, impacting over biodiversity (i.e., understory vascular plants) with different intensity along managed area (i.e., roads, extraction and stockpiled zones). The recovery in the first 50 years after harvesting is still poorly known. Therefore, we evaluated understory vegetation changes in shelterwood harvested N. pumilio forests of Tierra del Fuego, through a chronosequence (1-5, 6-10, 20-30 and >50 years after harvesting-YAH) focusing on two treatments: shelterwood cut zone (low impact harvesting-LIH) and stockpiled zone (high impact harvesting-HIH). Vascular plant species cover was sampled by point intercept method in fifteen 5 m-length transects per combinations of YAH and treatment (N=120). Richness was also evaluated, classifying species by origin (native-N vs. exotic-E) and life forms (shrub-S, erect herb-EH, prostrate herb-PH, caespitose grass-CG and rhizomatous grass-RG). Cover (origin and life form) and richness (origin) were compared by two-way ANOVAs considering YAH and treatments as main factors. Treatments significantly differed in EH ($F=14.66$; $p<0.001$) and N ($F=8.71$; $p=0.004$), and marginally in total cover-TC, with higher values for EH, N and TC in LIH (22%, 78% and 91%, respectively) than in HIH (9%, 52% and 69%). Regarding YAH, significant differences were found in EH, CG, PH, TC, N and E covers ($F>5.33$; $p\leq0.002$); with i.e., significantly higher values for early ages than later for EH, similar values at 1-5 and >50 YAH lower than at intermediate ages (CG, PH), greatest E cover at 6-10 YAH and lowest N cover at 1-5 YAH. Interactions occur for N, E and total richness, due to greater values at 20-30 YAH in HIH than LIH, but inverse response at others YAH periods. We conclude that impact intensity greatly affects native and exotic species richness and cover in *N. pumilio* forests, with different recovering in time for each life form and origin of species.

SOCIAL DIMENSIONS OF LAND CLEARING: SPATIAL MAPPING OF ENVIRONMENTAL VALUES IN QUEENSLAND, AUSTRALIA

Blake Alexander Simmons, University of Queensland; Angela Dean, The University of Queensland; Elizabeth Law, The University of Queensland; Clive McAlpine, The University of Queensland; Kerrie Wilson, The University of Queensland

Valuable remnant vegetation in Queensland, Australia continues to be lost amidst considerable seesawing of deforestation policy regulations, with policy-makers struggling to identify relevant policy instruments that can effectively curtail clearing rates. A growing body of evidence is showing that farmers may not be primarily driven by profit maximization, as is traditionally assumed; rather, the management behaviors of farmers may be more effectively driven by their underlying psychosocial characteristics, such as values, beliefs, attitudes, and social norms. This study will investigate these social dimensions of land clearing to identify what types of landholders are clearing remnant vegetation. A hierarchical agglomerative cluster analysis will be used to generate bottom-up clusters (i.e., typologies) of landholders within the Brigalow Belt South bioregion based upon responses from a questionnaire. Each typology will be defined according to landholders' social identity, environmental and policy attitudes, sense of security, perceived behavioral control, and historic clearing behavior. Correlations of these typologies with various demographic, socioeconomic, and psychosocial characteristics will also be tested. Each distinct landholder typology will then be extrapolated to generate a spatially-explicit map of the different types of landholders across the bioregion. Additional mapping may include the spatial heterogeneities of values, social

identities, attitudes, and mass media use—depending upon the results. The final spatial distribution of landholder typologies and characteristics will then be tested for correlations with observed clearing rates to estimate the relationship between regional-level psychosocial characteristics and land clearing. The conclusions drawn from this study will guide the selection of relevant and effective policy instruments that may reconcile future deforestation policies and outreach with the needs and values of the local landholders.

SOILS IN THE CANOPY OF OLD-GROWTH ALERCES (FITZROYA CUPRESSOIDES), SOUTHERN CHILE

Camila Tejo Haristoy, Universidad Austral de Chile; Mauro Gonzalez, Universidad Austral de Chile

Forest ecosystems are a reservoir of water, nutrients and habitat for a large array of organisms. In the canopy of temperate rainforest, epiphytes (plants that live on other plants but are not parasites) and its associated biomass contribute to forest' diversity. The accumulated biomass of epiphytes and host-tree litter, decompose within the treetops forming canopy or arboreal soils. Arboreal soils share similarities with organic soils on the ground and provide water and nutrients for canopy-dwelling organisms. Therefore, these soils could be a subsidiary source of nutrients for temperate forests. In this study we characterize canopy soils on five old-growth Alerces (*Fitzroya cupressoides*) from the Coastal Alerce National Park and the Valdivian Coastal Reserve, southern Chile. Epiphytic biomass of Alerce forests has been estimated in 8 Mg·ha-1. Canopy soil samples were taken between 12m y 20 m above the ground. Tree climbing techniques were used to access to the canopy minimizing the disturbance on the tree and its epiphytes. Soil characterization includes pH, bulk density (BD), CEC, mineral content, fiber, C and N content. Alerce soil's depth range between 7 and 23 cm, pH is acidic (3.8), fiber content range between 45-60% and on average BD is very low (0.06 g·cm3). This work aims to understand the role of the canopy and its soils on Alerce forests and to contribute as a base for future canopy studies. Alerce is the second longest-lived tree in the word and its populations have been diminished dramatically in the last century. Nowadays Alerces are considered endangered and are protected by law. Understanding the characteristics of these ecosystems could also provide a framework for management plans and conservation efforts.

SONIC CONFIGURATION OF A TRANSFORMED LANDSCAPE IN CENTRAL ANDES OF COLOMBIA

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Human intervention in landscapes leads changes in ecosystems and biodiversity, so if we want to maintain the ecosystem services that they provide, we must to evaluate these changes constantly, given the accelerate way in which they are occurring. The study of sound has been proposed as a tool that would fulfill this task, having the potential of describe and monitor intervened and natural systems, but there are few studies that use it in different land uses, comparing them and evaluating the changes between them. This study aims to describe the differences between zonotopes of three land covers at the municipality Salento, Quindío, a highly transformed and diverse area in central Colombian Andes, comparing their components biophony, geophony and anthrophony, and two acoustic indices: Normalized Difference Soundscape Index (NDSI) and Total Entropy. We found biophony constitutes the main component in all land covers, followed by geophony. Anthrophony is present in all of them but in few recordings and only in short events. Also, all of them exhibit high values of NDSI, indicating the predominance of biophony over anthrophony in sun coffee plantations and remnant forests, and low values of Total Entropy, showing low activity along the day. Finally, we found significant differences between three land covers for both NSDI and Total Entropy indices. The application of the soundscape ecology is therefore, useful to address the differences between natural and intervened systems. It opens the possibility of exchange knowledge between different disciplines to solve research problems, such as in the present study. However, its methods still require further exploration and evaluation looking for apply them directly in biodiversity conservation of these systems.

SPATIAL DISTRIBUTION OF TALL AND DWARF MANGROVES AND ITS INFLUENCING FACTORS

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Mangrove expansion and removals are a contentious and emotive issue. Mangrove distribution at global scale has been well documented. However, the distribution of tall and dwarf mangroves and its influencing factors at regional and local scales were lacking. The objectives are: (1) to determine spatial distribution and metrics of

tall and dwarf mangroves at regional scale, variation among estuaries, part of estuaries, and mangrove groups; (2) to assess potential influencing factors of tall and dwarf mangroves distribution; (3) to examine the sources and similarity of the potential influencing factors among estuaries. Field survey, satellite images, and aerial photographs were used. Auckland region, New Zealand is habitat for tall (5,766ha) and dwarf mangroves (4,717ha), it represents 5% of the global temperate mangroves. Mangroves were distributed in big (72%) and small estuaries (28%). Tall and dwarf mangroves were distributed differently among the estuaries. Spatial metrics (shape, proximity index, perimeter, and number of patch) of tall mangroves differ from dwarf mangroves. The most dominant mangrove groups were: estuarine mangroves (70%), followed by riverine (29%) and delta mangroves (1%). Riverine and delta were dominated by tall mangroves, 79% and 69%. Dwarf mangrove were more distributed in estuarine (53%). Tall mangroves were distributed further to the south than dwarf. Tall mangroves were also distributed further up-river which strongly freshwater-dominated. Sediment accumulation rate, tide, grain size, sea surface temperature, and soil class were significantly correlated with both tall and dwarf mangrove distribution. These factors explain over 83% of the variability in the mangrove distribution. Sources of these factors were upland and sea. High similarity (97.5%) of the influencing factors among estuaries were found. This information is important because conservation actions and managing mangroves is largely occurring in localised areas.

SPATIAL ECOLOGY OF SOUTHERN AUSTRALIAN BOTTLENOSE DOLPHINS INHABITING A MARINE PROTECTED AREA

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Assessments of demographic parameters and site fidelity are essential to understand the dynamics of wild populations and for their efficient conservation and management. We investigate sex-specific abundance, apparent survival, temporary emigration, site fidelity and ranging patterns of southern Australian bottlenose dolphins (Tursiops cf. australis) inhabiting Coffin Bay, an inverse estuary located in Thorny Passage Marine Park, South Australia. Results are based on capture-recapture modelling of photo-identification data and molecular analyses of biopsy samples collected during boat-based surveys between September 2013 and October 2015 in the inner and outer areas of Coffin Bay. The total number of dolphins using the entire study area (263 km2) was estimated at 306 (95% CI: 291–323). Seasonal estimates of abundance for the inner area remained relatively constant (marked females: 52–60, marked males: 46–52, total: 193–209). Estimates of apparent survival for both females (0.99; 95% CI: 0.96–1.0) and males (0.95; 0.82–0.99) were high, and overall temporary emigration rates (0.02; 95% CI: 0.01–0.11) were low. Agglomerative hierarchical clustering of individuals' site fidelity to the inner area identified three groups: 'permanent residents' (n=125), 'occasional residents' (n=28), and 'occasional visitors' (n=26). Representative ranges of resident dolphins varied from 3.9 to 33.5 km2 (mean ± SD = 15.2 ± 6.8 km2), indicating that individuals exhibit fine-scale spatial structure to small areas. These findings highlights the importance of Thorny Passage Marine Park for this population, and particularly of the inner area of Coffin Bay as it offers highly favourable habitat and provide the resources needed by these dolphins year-round. This study provides a robust baseline of sex-specific population demographics and representative ranges of southern Australian bottlenose dolphins, which have important implications for their management and conservation in South Australia.

SPATIAL PRIORITIZATION OF CONSERVATION AREAS IN THE DEPAYOF HUILA, COLOMBIA

Diana Diaz Gomez, ONF Andina; Juan Ricardo Osorio, Onf andina

In order to spatially prioritize areas of the department of Huila (Colombia), a method was developed that combines the degree of general importance for the connectivity of forest patches, the perforations within the remnants of natural cover and the degree of naturalness of the land cover. The general importance for patch connectivity was obtained from the combination of the importance indices of fragments known as "connectivity providers" calculated using the Conefor software: Integral Integral index of connectivity, Probability of connectivity, PC connector, Betweenness centrality, IIC connector. The last three indexes prioritize those fragments that behave like Stepping Stones in the landscape. The perforations were identified with the Landscape Fragmentation Tool software. This method gives higher priority to those areas with a high degree of naturalness that contribute to the connectivity of the landscape, which have been altered and are perforations inside forest cores, in addition to those that are highly important for connectivity or priority areas for restoration. The prioritization obtained resulted in a categorization (low, medium, medium - high, high

and very high), which was taken into account to perform a connectivity evaluation for two restoration scenarios. The first scenario the analysis was made assuming that the units with high category are restored and the second one was performed assuming the restoration of the units with medium - high category. The results are compared to see the increase in connectivity over the landscape. That showed variations in connectivity rates ranging from 8% to 40%. This methodology provides the possibility of finding areas with specific characteristics where restoration processes could have a greater impact over ecological connectivity.

SPOTTED HYENA DEN SITE SELECTION CRITERIA IN HWANGE NATIONAL PARK, ZIMBABWE

Cynthia Mapendere, University of Pretoria

Elephant population beyond an area's carrying capacity results in opening up of habitats leading to the detriment of other species. Suitable den sites are crucial for reproduction among carnivores. Spotted hyenas were taken as proxy for other species that depend on vegetation cover for successful reproduction by hiding their newly born. 72 active hyena dens were compared with 72 non-active using GPS collar data from five hyena clans in HNP. Vegetation attributes and elephant damage were assessed up to 50m from the identified dens. Diameter of entrance, distance to the road and water were also recorded. The results showed that woody vegetation type (Ψ =11.31, $p < 0.05$, n = 72, DF=5, visibility (t = 2.17, p = 0.034, n = 72), shade availability (Ψ =19.24, $p < 0.05$, n = 72, DF=1),) and diameter of entrance (t =-2.49, p = 0.015, n = 72) influenced den selection. The spotted hyenas selected den sites were located under the shade, with a visibility distance of about 25m, entrance diameter of approximately 39cm and were located in Teak-Brachystergia vegetation type. Distance to road (t =1.48, p = 0.141, n = 72) and water (t =0.570, p = 0.567, n = 72) did not influence den site selection. It can thus be concluded that den selection by spotted hyenas was influenced by cub protection from predators e.g., lions, food availability and protection from harsh weather. This is one more piece of evidence pointing that further growth of the elephant population should be curtailed as it may be detrimental to other wildlife species, like the hyena, that rely on vegetation cover to protect their young.

STAKEHOLDERS' PERSPECTIVES ON SPECIES MANAGEMENT, PRIORITISING ACTIONS TO PRESERVE OUR BIODIVERSITY

Hernan Caceres, University of Queensland; Scott Atkinson, University of Queensland; Katrina Davis, University of Queensland; Salit Kark, The University of Queensland

While it is well-known that incorporating the perspectives and preferences of communities may lead to better conservation outcomes (i.e., long-term commitments, active participation, etc.), it is not a common practice. The literature describes several techniques to engage with the private sector, government agencies, and communities in conservation planning, but these are not applied mostly due to the challenges of achieving consensus (e.g., timeframe, existing plans, and clashing objectives). The prevalent practice often involves an individual assessment, and then to await for managers to make decisions. In this project, we identified and incorporated the various perspectives and preferences of different stakeholders in Minjerribah-North Stradbroke Island (QLD, Australia), regarding the conservation of threatened, and culturally relevant species that are being impacted by 2 of the most successful invasive alien species in Australia: feral cats (Felis catus) and red foxes (Vulpes vulpes). We assessed the priorities and perceptions of multiple stakeholders from community groups, the private sector, and government agencies, in a spatially and temporally-explicit way. This approach reduces the gap between practitioners, the private sector, and community groups, by encouraging involvement and long-term commitment. It provides a platform for better understanding between participants, reduces management uncertainties, and facilitates the development of a unified management plan for culturally relevant, threatened, and invasive alien species in highly-vulnerable environments such as islands.

STRUCTURE AND CREDIBILITY OF POPULATION VIABILITY ANALYSIS IN THE 21ST CENTURY: A REVIEW

Vratika Chaudhary, University of Florida

Population Viability Analysis (PVA) is considered a key component in the management and recovery plans of endangered species. This analysis is a modelling tool used to estimate the risk of extinction to the populations. PVA works by incorporating demographic data and environmental and genetic stochasticity to project the risk of extinction to the species. After the very first application of PVA in 1971, the approach has gained popularity in conservation biology. Numerous studies have used PVA modelling approach to quantify the threats to the endangered species. Computer simulation

programs have made the application of this technique very frequent. However, these user-friendly programs have also led to the abuse of PVA application. In this study we review 112 peer reviewed publications that predicted extinction risk, mean time to extinction or probability of persistence of different mammalian and avian species. Our analyses conclude that more than 68% of these studies were conducted using generic computer programs and 49% of the studies consisted data of poor quality. We also evaluated the studies based on their statistical soundness; inclusion of demographic, catastrophic and genetic component; sensitivity analysis and methods used for sensitivity analysis; and the background information about the study system. We found that the PVAs based on user friendly generic programs were predominant and were also correlated with inferior quality of the data. The PVAs continue to be popular in the field of endangered species management and the need for the quantification of extinction risk will maintain their popularity. Our study provides an opportunity to reflect into the mechanisms that PVAs have continued to be conducted in for the last twenty years. This review will help strengthen the guidelines that are recommended to conduct any population projection studies predicting extinction risk.

STUDY ON MANAGERS' PERCEPTIONS OF PROTECTED AREA OUTCOMES IN MADAGASCAR

Johanna Eklund, University of Helsinki; Mar Cabeza, University of Helsinki; Marissa McBride, Harvard University; Aili Pyhälä, University of Jyväskylä

Establishing protected areas (PA) is one of the main tools available for halting biodiversity loss. Considerable effort has gone into assessing how effective PAs are at mitigating threats to biodiversity and investigating their impacts on local communities. However, to date little is known about how these pressures are being perceived and dealt with by managers on the ground. To address this research gap, we designed and administered a questionnaire to PA managers in Madagascar (n=26) to assess their views on the impact of PA establishment on the trends in animal and plant populations and the threats they face, and the possible drivers behind these changes. To complement the questionnaire data and gain additional understanding into PA manager perspectives we also organized a one-day workshop with PA managers (n=17) in which managers discussed priority issues with regard to PA management and brainstormed potential strategies for improvement. We found that PA mangers reported threats as having been high prior to PA establishment, and that PAs have been successful in reducing these threats, at least relative to surrounding areas. However, PA managers lacked specific knowledge regarding changes in species abundance, and reported the need for more species monitoring and knowledge transfer between scientific researchers and PA managers in the future. In general, many of the main problems identified by managers were related to legal and political challenges at the state level, beyond the control of a local manager. Managers also identified many challenges in working with local communities, but viewed co-management with local stakeholders, and particularly with local communities, as important for PA success. This work revealed important insights into on-the-ground challenges being faced by PA managers and led to the identification of important knowledge and resource gaps and governance issues that could be addressed in working to improve PA effectiveness in Madagascar.

SUB-LETHAL HEAT EXPOSURE POSES THREATS TO ARID BIRD CONSERVATION

Liam Bailey, Australian National University

Rising temperatures in a changing global climate will present organisms with new thermoregulatory challenges, especially for those species living in already hot and arid environments. Research into the impacts of temperature extremes on arid species will be needed to understand the implications of climate change for arid ecosystems. Birds may be particularly vulnerable to such temperature extremes due to their diurnal nature and active foraging, leaving them vulnerable to hyperthermia or dehydration. While severe heatwaves are well known drivers of bird mortality, there is also growing evidence that sub-lethal high temperatures can have substantial fitness consequences. Current research has shown that extended exposure to sub-lethal high temperatures can compromise chick development and reduce adult body mass, with direct effects on survival and reproduction; however, these findings have so far been limited to a few focal species, making broad conclusions difficult. This work investigates the impacts of sub-lethal high temperatures using an extensive dataset comprising two long-term (30 year) banding sites in semi-arid Australia. We compare the impacts of temperature on body condition in 18 passerine species and consider how these effects may interact with precipitation patterns. We then investigate how consistent these patterns are between our two study sites. Body condition declined in response to high temperature exposure in both of our two sites, suggesting that impacts of high temperatures may be generally applicable to arid bird species. Global climatic change and greater frequency of temperature extremes may therefore pose a particular conservation threat for arid bird species, even in those scenarios where lethal temperature limits are not reached.

SURVIVAL OF REINTRODUCED ASIAN HOUBARA IN UNITED ARAB EMIRATES' RESERVES

Joseph Azar, Reneco Wildlife Consultants

Increasing knowledge of post-release survival and habitat requirements of translocated animals is critical to improve success of conservation programs. We estimated survival of reintroduced captive-bred Asian houbara bustards (*Chlamydotis macqueenii*) in reserves of western United Arab Emirates where plantations exist as supplementary feeding sites. We explored factors influencing short- (3 months after release) and long-term (tri-monthly periods after third month of release) survival rates of released birds. We modeled life histories of individually tracked houbara using Program MARK. Mean short-term survival probability (0.76 0.14 SD) was lower than mean long-term survival (0.86 0.03 SD), and observed group size and the age of released birds positively correlated with short-term survival. We hypothesize that higher quality habitat (plantations) affected survival; larger groups occurred in plantations and older birds might be better able to maintain access to plantations. Long-term survival was negatively influenced by subsequent release events. Releasing more individuals increases local houbara density. This may lead to food depletion, increase in density-dependent mechanisms between individuals, or both. Short- and long-term survival rates suggest that food availability at the release sites, together with intraspecific interactions, may influence survival of newly released and established individuals. To improve the management of translocated animals, the impact of managed food resources should be quantified to assess how it might affect population vital rates.

TARGETING TROPICAL FOREST CONSERVATION CONTRACTUAL DESIGNS TOWARD HIGH-RISK LANDOWNERS

Phillip Mohebalian, World Wildlife Fund; Francisco Aguilar, University of Missouri-Columbia

Payment for Forest Conservation (PFC) programs financially compensate private landowners to maintain and increase the provision of ecosystem services. Their impact nonetheless remains contested questioning their effectiveness and additionality. The design of PFC contracts can increase participation, particularly among those less likely to participate, potentially enhancing a program's additionality. We examined preferences for select PFC contractual attributes among over 200 private forest owners in Ecuador's Amazon basin using a stated choice-experiment. Results indicate strong heterogeneity in PFC preferences. Forest owners at high-risk of deforestation, as compared to low-risk forest owners, were almost eight-times more likely to select contracts that allowed the sustainable harvest of timber and about three-times more likely to select contracts provided by local (over central) governments. To increase PFC additionality in preventing deforestation PFC contracts should revisit financial incentives, be managed by local governments, allow sustainable timber harvesting, and seek perpetual binding. Arguably, instead of simply increasing monetary compensation PFC programs could embrace sustainable management, thereby targeting the enrollment of forest owner are greater risk of deforesting.

TEMPORAL CO-OCCURRENCE OF THE FLORIDA PANTHER WITH COEXISTING SPECIES

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The population of the endangered Florida panther *Puma concolor coryi* has increased in the last two decades, which can lead to an increased frequency and intensity of interactions between panthers and coexisting species. Using data from a camera trap study, we investigated the diurnal activity pattern of the panther, and evaluated temporal overlap in activity pattern between panthers and prey species (white-tailed deer *Odocoileus virginianus*, raccoon *Procyon lotor*, wild boar *Sus scrofa*, and wild turkey *Meleagris gallopavo*), and potential competitors (bobcat *Lynx rufus* and black bear *Ursus americanus*) in Big Cypress National Preserve, Florida. Fifty camera traps operated continuously for 7849 trap-nights, yielding a total of 4272 independent pictures for the species of interest. Panthers showed two peaks of activity around sunrise and sunset and were less active during daylight hours. Bobcats displayed a similar activity pattern; black bears and most prey species were predominantly active at daytime; and raccoons exhibited a cathemeral pattern. Temporal overlap of panther activity pattern was most extensive with bobcats (overlap coefficient, Δ=0.89) and raccoons (Δ=0.77); and generally low with those species active at daytime (Δ, bear = 0.46; deer = 0.42; boar = 0.28; and turkey = 0.26). Our results suggest that: (1) no apparent temporal avoidance occurs between panthers and bobcats; (2) black bears may reduce direct or apparent competition with panthers via temporal segregation; (3) prey species may minimize predation risk by reducing their activity when panthers are more active. In particular, white-tailed deer activity pattern in BCNP differs from areas where panthers are absent. Conversely, raccoons show high temporal overlap with panthers despite being an important prey species. A better understanding of interactions between panthers, their prey, and potential

competitors can inform management strategies to ensure future persistence of the Florida panther.

TEMPORAL PATTERNS IN UNGULATE DISTRIBUTION ALONG THE ROAD-NETWORK OF A SOUTH AFRICAN PROTECTED AREA

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Roads can increase mortality risk, fragment habitats, and act as barriers that spatially structure populations; and these impacts can occur even in formally protected areas. In Africa, little is known about the effects of roads in protected areas, yet most touristic wildlife-viewing activities are made from motorised vehicles with the associated development of road-networks. We used seasonal occurrence data of six ungulate species (nyala, impala, warthog, zebra, red duiker and blue wildebeest) to test (i) whether ungulates avoid being in proximity to roads, (ii) if patterns of avoidance differed among species, and especially (iii) if differences occur between seasons or times of the day. Data were collected in the early morning (3 hours after sunrise) or the late afternoon (3 hours before sunset) during the dry and wet seasons from 2010 to 2014 along road transects in the Mun-Ya-Wana Private Game Reserve, South Africa. We recorded 3901 geo-referenced occurrences that included group size and individual sex- and age-class attributes. Using GIS information, we then determined vegetation type, and distance to roads, settlements, and surface water for each occurrence. Species distribution including temporal patterns differed more due to vegetation and water availability than sources of human disturbance including roads. This relatively small effect of roads could be due to either habituation to traffic or the relatively low volume of circulating vehicles within this reserve. Our results provide a greater understanding of wildlife responses to road-related disturbances within protected areas accounting for environmental and specific responses, and are also relevant to local management.

THE EFFECTS OF TROPICAL FOREST FRAGMENTATION ON HUMMINGBIRD MEDIATED POLLEN FLOW

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Pollen-mediated gene flow is the avenue that maintains genetic diversity within seeds. However, if forest fragmentation limits the movement behavior of pollinators, then the quality of pollination services may be reduced, thereby catalyzing the loss of seed genetic diversity in small and isolated habitat patches. We assessed the cascading effect of hummingbird pollinator response to tropical forest fragmentation on genetic diversity of *Heliconia tortuosa* seeds. This plant is a tropical forest keystone species that is mostly pollinated by traplining hummingbirds that avoid crossing non-forested areas. Pre-dispersal seeds, sampled near Las Cruces Biological Station in Costa Rica, were collected from mother plants in a stratified random sample of 33 forest patches (five plants per patch, three seeds per plant) that varied in forest patch size and amount of surrounding forest. Linear mixed models of observed heterozygosity (based on 11 microsatellite loci) showed an effect of patch size and a weak interaction between patch size and connectivity. Seeds from small-isolated patches presented low mean observed heterozygosity, while seeds from large or connected patches revealed higher levels of genetic diversity. This suggests that change in pollinator movement behavior due to forest fragmentation affects gene flow in *H. tortuosa*, decreasing the quality of pollination in patches that are small and isolated. To overcome the negative effects of fragmentation on seed genetic diversity, and to ensure long-term population fitness, increasing patch size and enhancing genetic connectivity in small-isolated fragments must be a priority.

THE GENETIC DIVERSITY OF THE ASIAN ELEPHANT ACROSS ITS DISTRIBUTION

Kris Budd, University of Missouri; Lori Eggert, University of Missouri

The Asian elephant (*Elephas maximus*) is an endangered species whose rapid decline can be attributed to habitat degradation and fragmentation. While the largest populations of Asian elephant are found throughout India, smaller yet viable populations are found within Lao PDR, Cambodia, Vietnam, Thailand, Malaysia, Indonesia, and China. Indian populations are larger and therefore on average have been heavily monitored and studied. Here we describe the range wide diversity with nuclear and mitochondrial markers by utilizing an extensive library of published data from across the species distribution. In Asian elephants, nearly every study uses identical markers; making them able to be cross referenced quite effectively. Our aim was to identify areas of high genetic diversity in order to inform management of areas with high conservation need. Our results demonstrate the value of smaller populations in preserving the overall genetic

integrity of the Asian elephant for future generations. They additionally suggest that while populations found in the Southeast Asian peninsula are on average smaller, they represent a wealth of genetic diversity often unseen in the larger populations of India. These comparatively high levels of genetic diversity raise questions of their own as to the recent evolution and compression of Asian elephants throughout their native range.

THE IMPACT OF A ROAD ON A BIRD COMMUNITY IN A PROTECTED AREA, IN SOUTHERN BRAZIL

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Roads are high-impact fragmentation agents because they affect the physical, chemical and biological characteristics of an ecosystem. Birds are highly susceptible to habitat fragmentation, traffic noise, roadkills and other disturbances generated by the roads. These impacts can be manifested in the structure of bird communities. The goal of this study was to evaluate the effects of a road on a savannah bird community in southern Brazil. The study was carried out in the Espinilho State Park (ESP). The ESP is crossed by a road and three transects were established, parallel to the road and at different distances from it (10; 250 and 500 meters). For sampling the richness and abundance of birds at each transect we used the point count method. Sampling took place throughout during the summer 2014-2015. The vegetation typology was predominantly Savannah Park and there were no differences in habitat or elevation among the transects. A total of 108 bird species was recorded, distributed among 38 families. The number of species and individuals recorded per sample point in each transect was different between the three transects and has increased with greater distance from the road ($F = 5.75$, $P = 0.01$; $F = 5.84$, $P = 0.01$; respectively). Of the 108 species recorded, only 38 occurred in all three transects. The transects closer to the roads showed lower similarity (T1xT2, $N = 44$, $SJij = 0.48$) than those that were more distant from the road (T2xT3, $N = 57$, $SJij = 0.64$). Our data indicate that the effects of a road alter the species composition and structure of the bird community in the ESP. This can occur due to the attraction of some species to near the road or the exclusion or population reduction of others. We reinforce the recommendation that roads should be avoided near or within areas destined for conservation. In protected areas where roads cut through or around them, studies on the impact of these roads and possible mitigation measures are essential and urgent.

THE IMPORTANCE OF SPECIES INTERACTIONS FOR PREDICTING SPECIES DISTRIBUTIONS AT THE CONTINENTAL SCALE

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Species distribution models (SDMs) are widely used to tools assess habitat suitability and to predict the future geographical range of species under different scenarios. An increasing number of studies indicate that biotic interactions (i.e., competition, predation) may influence the distribution of species across large spatial scales. However, the vast majority of continental to global scale SDMs do not account for species interactions, thereby disregarding key processes that maintain diversity and shape species distribution. Recently, joint species distribution models (JSDMs) have been proposed to overcome this limitation. However, the performance of these models has not been tested on a large spatial scale. In this study, we tested the performance of JSDMs in predicting the joint distribution of a large number of plant species at a European scale. These models were built with data from the European Vegetation Archives (EVA) which contains 1.4 million vegetation plots with occurrence data on plant species in Europe. Species occurrences were combined with a set of climate and soil characteristics that we expected to influence plant growth via water availability, temperature, light availability and nutrient availability. We compared the performance of two JSDMs, one based on generalized linear models and one based on artificial neural nets, with the performance of a random forest and a generalized boosted model based solely on the abiotic predictors. Model performance was quantified on a species basis and total species richness using the true skill statistic and the area under the receiver operating curve. The JSDMs tested here can provide insights on how species interactions shape the global scale distributions of species and can be used when these interactions are not known a priori. We provide guidelines to decide when and how interactions between plant species should be accounted in constructing species distribution models at large spatial scales.

THE INTERSECTION OF REPRODUCTIVE RIGHTS AND ENVIRONMENTAL RIGHTS IN GUATEMALA: A CASE STUDY

Midori Altamirano, Planned Parenthood Global

One of the largest environmental organizations in Guatemala saw that where the environment is most

fragile, so are women's reproductive rights, and that healthy and empowered women play an important role in the stewardship of environmental sustainability in communities. With the support of an international NGO, the Guatemalan organization has assessed environmental and reproductive health factors affecting communities in two protected areas. In 2009, the Guatemalan organization conducted a KAP survey in nine communities (n=226), which was replicated in 2014. Pearson's chi-square and independent samples t-tests were used to identify significant differences between the populations at baseline and endline. These comparisons reveal significantly greater access to reproductive health services and information, as well as increased women's autonomy regarding their family's health. For example, after five years, twice as many respondents knew where to access contraceptives (80% v 40%), twice as many have sought prenatal care (60% v 30%), and more women have become active decision-makers in their households (> 60% v < 50%) [p<.05 for all]. Baseline survey results in 2009 highlighted a significant need for reproductive health information and services, and endline results demonstrate that this Guatemalan organization's programming has been successful on both fronts. This suggests that environmental rights organizations can effectively address reproductive rights concurrently, improving not only women's health outcomes but also environmental sustainability.

THE JUMBO PROBLEM OF HUMAN-ELEPHANT COEXISTENCE IN CHOBE, BOTSWANA

Samantha Garvin, Yale University

While elephants look like gentle giants, living with elephants is no small task. Elephants can injure people or damage property, and in Chobe, where there are more elephants than people these interactions occur with great frequency. These interactions can erode tolerance of elephants and broader conservation goals over time. Chobe is undergoing rapid changes; development is putting pressure on wildlife movements throughout townships. The tourism industry is attracting people from other parts of Botswana to Chobe. These migrants, who have never lived with elephants before, now interact with them regularly, leading to greater incidence of conflict. Non-governmental institutions address this problem by conducting research and educating community members on how to protect themselves and personal property. The central government implements mitigation strategies and a compensation scheme to repay individuals for property damage. This study utilizes semi-structured interviews and discourse analysis techniques to look across all sectors at the various institutions' perspectives of the problems with human-elephant conflict. How the actors perceive the problems of living with elephants influences what kinds of solutions are proposed and carried out. Most participants see the problem as biophysical, a consequence of overlapping human and elephant habitat. Other participants identified issues with how decisions are made and carried out. A small proportion sees the relationships and motives of different actors as influencing the problem. This analysis argues for reconstructing a social context and decision process to identify common goals and work towards coexistence.

THE MAP OF LIFE APP: SUPPORTING EDUCATION AND CITIZEN SCIENCE FOR BIODIVERSITY IN LATIN AMERICA

Diego Ellis Soto, Yale University

One of the biggest questions in biology may be why species live in certain places while absent from others. Yet, we know surprisingly little about the geographic patterns of biodiversity for most areas in the world. We introduce the Map of Life Application, which empowers every smartphone phone user to discover and identify flora and fauna, as well as record and share species sightings. Citizen science is becoming an essential part of large scale data collection. The Map of Life app offers a comprehensive database that provides best possible estimates for approximately 40,000 species covering a vast taxonomic range. The app has global spatial coverage (https://mol.org) and can be used offline in remote areas. We will explain how the Map of Life app can be used for biodiversity science education purposes and how citizen science data can be used to understand macroecological patterns of biodiversity. The combination of a comprehensive, scientifically-rigorous database and a powerful app that supports an offline mode will allow users to submit vital biodiversity records from anywhere around the world. Users can harness the power of citizen science and smart phone technology to gather data from the remote, under-reported regions of the world. Furthermore, the Map of Life app was voted the best science app in 2016 by the American Library Association and has been recognized as an effective educational resource.

THE ROLE FOR SEED BANKS IN PLANT CONSERVATION

Eva Martens, Royal Botanic Gardens Kew

The Earth's flora is in crisis; one in five vascular plant species are under threat. Plants are facing a wide range of threats across all habitat types. Ex situ conservation is recognised as vital for plant conservation under Target

8 of the Convention on Biological Diversity's Global Strategy for Plant Conservation, complementing in situ conservation activities. Seed banks as one element of ex situ conservation are an effective method of conserving plant genetic resources, and they are an essential component of climate change mitigation and adaption. Ex situ conservation is recognised as a low cost and effective method of plant conservation. Seed banking uses common resources to address multiple conservation challenges simultaneously, for example crop species for the future of food sustainability, habitat restoration and species conservation. Seed banking is highly interdisciplinary engaging practitioners in phylogenetics, ecology, applied conservation and local community stakeholders. However, it is often overlooked among the broader conservation community and as such there is a call from within the ex situ community to boost the ex situ seed conservation effort. The Millennium Seed Bank Partnership (MSBP), managed by the Royal Botanic Gardens Kew (United Kingdom) is the global network for ex situ plant conservation and one of the largest conservation projects. The MSBP is partnered with 137 institutions across 97 countries. This has enabled the MSB to bank over 37, 000 species as we work towards the Kew Science Strategy output of Banking the World's Seeds. The MSBP undertakes research including seed longevity, predicting recalcitrant species and conservation priorities of crop wild relatives. Furthermore, data generated from the MSBPs work is being used to answer ecological questions about plant regeneration and the future of plants under climate change. This research can detect knowledge gaps in seed ecology, which influences the conservation agenda and policy.

THE ROLE OF ROOTS IN SURVIVAL STRATEGIES OF TROPICAL TREE SPECIES

Coline Boonman, Radboud Univeristy; Imma Oliveras, University of Oxford; Frank van Langevelde, Wageningen University and Research Centre; Elmar Veenendaal, Wageningen University and Research Centre

Trait-based models are widely used to explore vegetation dynamics, but transition zones are difficult to predict. In the transition between forests and savannas, multiple factors such as soil fertility and fire may play a role in the recruitment and survival of seedlings. To improve modelling efforts, it is essential to understand what traits are involved in species' survival strategies. The role of root traits in this is a relatively unexplored area. We aim to determine root trait differences between tree species from the tropical transition zone and link this to different survival strategies. We conducted a greenhouse common garden experiment growing seedlings from 27 species, representing the full transitional gradient from semi-deciduous forests to the drier savannas in Africa. Biomass and fine root length distribution were used for comparison between the guilds. We found a higher mean rooting depth for species occurring in drier areas, both of forests and savannas. This increased biomass allocation towards deeper roots may allow them access to water during dry periods. Species from moist forests have a lower mean rooting depth, as they have a larger total fine root length close to the soil surface. This enables them to compete for water and nutrients. Species from moist savannas have the lowest mean rooting depth. They have a large storage organ just below the soil surface, which may provide seedlings with the required resources to re-grow after fire events and escape the firetrap in due course. We concluded that variation in root traits can be linked to different survival strategies of seedlings of tropical tree species growing under different stresses. This information can be used to interpret species shifts and, by including species' survival strategies in models, to predict forest-savanna dynamics. This is particularly important as climate change (including shifts in fire regimes) are expected to affect biome transitions in tropical regions.

THE ROLE OF TEMPERATURE ON INTRASPECIFIC INTERACTIONS, AN EXPERIMENTAL STUDY ON A TEA PEST MOTH

Barbara Joncour, Biology Department Queen's University

Understanding how abiotic factors affect population dynamics is fundamental to predict how species respond to environmental variation. While many studies report high correlations between climate change or seasonal variation, and shifts in population dynamics in several natural systems, there is little work on population processes in response to variation in the abiotic environment, and this work is mostly theoretical. Temperature is a pacemaker in ectothermic species and our inability to predict single-species population dynamics of ectotherms in response to temperature is surprising, given how much is known about its direct effects on individual life-history traits. My study seeks to understand the role of temperature on intraspecific interactions, the missing key element that links individuals to their population dynamics. A laboratory experiment was conducted on a pest insect species, the tea tortrix moth (*Adoxophyes honmai*) (Yasuda) (*Lepidoptera: Tortricidae*), which is a new model system for experimental population ecology. The tea tortrix moth damages tea plantations in Japan leading to significant loss in tea production and economical value. The effect of temperature on life-history traits were empirically investigated, where same-aged cohorts of larvae developed under direct or indirect intraspecific interactions

(together or isolated) among the temperatures 16, 22 and 28oC. The larval development, survival and reproduction rates of the tea tortrix were negatively affected by intraspecific larval-interactions and the strength of intraspecific competition was temperature-dependent. These results provide direct evidence that temperature affects individual life-history traits both directly and indirectly through intraspecific interactions. I suggest that the role that temperature plays at the individual scale should be emphasized when building population models, to better predict and implement species management strategies.

THE ROLE OF UNBURNT HABITAT PATCHES FOR THE PERSISTENCE OF BIRDS IN A FIRE-PRONE LANDSCAPE

Zoe Reynolds, Australian National University

Unburnt patches within a fire boundary can act as refuges for fauna, facilitating their survival and persistence within fire-prone landscapes. It is often assumed that after a fire any patch of unburnt vegetation will provide superior habitat to the surrounding burnt matrix, however the value of unburnt patches of differing characteristics has rarely been explored. The value of unburnt patches is likely to be determined by a combination of spatial and ecological characteristics. We investigated the effects of different unburnt patch characteristics on the composition, abundance and species richness of semi-arid woodland bird communities in South Australia using three years of monitoring data from 149 locations with varying fire histories and patchiness. Variation in bird communities across burnt and unburnt habitat, and between unburnt patches, was correlated with differences in habitat structure and general vegetation type but not floristic differences or spatial characteristics of patches. These patterns were largely driven by the habitat preferences of different bird species, which were consistent within foraging guilds. Unburnt patches play an important role in facilitating the persistence of birds in the landscape after major fire events. With a better understanding of which characteristics of unburnt patches are valuable for different species, we may be able to prioritise areas to protect in future fire events.

THE SOUTHERN CONE CHAPTER: A PROPOSED APPROACH TO BRIDGE SCIENCE AND PRACTICE IN SOUTHERN SOUTH AMERICA

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The Southern Cone of South America (Argentina, Chile, Uruguay, Paraguay, and parts of Bolivia and Brazil), share an extraordinary diversity of ecosystems. These include template forests, grasslands, and Great American Chaco among others. These ecosystems and the ecological processes they harbor are under great threat and require regional conservation efforts. Here we present the first SCB Southern Cone Chapter which was created to promote regional conservation efforts, advance information sharing, and effectively connect science and practice through active participation of a broad set of stakeholders. Furthermore, we present a brief description of the challenges of conserving biodiversity in the Southern Cone and potential key actions that could be implemented or strengthened to advance science and practice.

THE USE OF ECOLOGICAL INDICATORS TO GUIDE EVERGLADES RESTORATION EFFORTS

Ruscena Wiederholt, Everglades Foundation; Stephen Davis, Everglades Foundation; Melodie Naja, Everglades Foundation; Rajendra Paudel, Everglades Foundation; Tom Van Lent, Everglades Foundation

The Everglades wetlands in Florida, USA, is a highly altered ecosystem that has been reduced to 50% of the original area. The Everglades are threatened by a variety of factors including drainage, development, invasive species, climate change, pollution, and changes in regional hydrology. Ecological restoration of the Everglades is a complex federal-state partnership involving billions of dollars, and multiple groups of stakeholders. Assessing whether restoration goals can be met under different restoration scenarios is critical, as well as understanding how these scenarios may vary by species and across space. Here, we use a set of ecological indicators to predict the success of restoration efforts in the Everglades. Our set of indicators covers multiple regions and trophic levels, and includes species responsive to various landscape characteristics and physical properties. Using a set of quantitative ecological models, we first compare a baseline condition, with no management actions, to a full set of management actions. Then, we compare the baseline condition to a scaled-back, reduced set of management actions. Our results will inform management and restoration efforts, and can be used to guide policy for the greater Everglades area.

THE VULNERABILITY OF TWO ARBOREAL PRIMATES IN AN ANTHROPOGENIC HABITAT

Maria Joana Ferreira Da Silva, Porto University (CIBIO/InBIO); Tania Minhos, Nova University of Lisbon

The rapid pace of forest degradation stands as a major challenge to the ability of forest dwelling primates to adapt to changes in their habitat. Apart from reducing the habitat availability, the loss and fragmentation of the forest also opens new routes that increase the commercial hunting of primate natural populations, imposing a great threat to their long-term survival. In this work we combined behavioral and genetic data to compare the socio-genetics and demographic history of two sympatric primates—the Western black-and-white colobus (*Colobus polykomos*) and Temmick's red colobus (*Procolobus badius temminckii*)—in the fragmented Cantanhez National Park, which is one of the last pockets of forest in Guinea Bissau. We found that both species exhibit changes in their behaviour (e.g., dispersal patterns, social relationships) that could be explained by the recent changes in their habitat. Moreover, we detected a strong and recent demographic bottleneck for both species, which we inferred to have resulted from the anthropogenic exploitation of forest resources in the last centuries. The very low estimated effective population sizes for both primates and the known demographic tendencies indicate that they are under imminent risk of extinction in the park, and by extension in Guinea Bissau, if urgent action is not taken. The stronger bottleneck in *P. b. temminckii* and the fact that this species is absent from the most degraded forests in the park, suggest that it is particularly susceptible to human disturbance. This trend for *P. b. temminckii* is reinforced by the fact that we detected that adult females are cooperating with non-kin partners, possibly as a response to increased intra-group competition resultant from degradation of their habitat. Additionally, we detected significant numbers of individuals from both species being traded in urban markets for bushmeat consumption, which greatly contributes to the high vulnerability that both primates face in Guinea Bissau.

THERMAL SENSITIVITY OF TROPICAL AMPHIBIANS AND THEIR VULNERABILITY TO CLIMATE CHANGE

Hilton Oyamaguchi, Drexel University

The impacts of climate change may be more severe on tropical than temperate ectothermic organisms. Tropical ectotherms have evolved in relatively stable aseasonal climates compared to temperate species. As a consequence, negative impacts of climate change should be the greatest on tropical ectothermic species. The thermal tolerance ranges of species reflect their physiological adaptation to climates. They provide appropriate data for the assessment of the impact of global warming in geographic distribution. To predict how climate change will impact a species, we are investigating the thermal limits of the tropical ectothermic organisms from the Congo and Amazon Basin and from the Gamboa Rainforest (Panama). We are using the critical temperatures, performance breadth, optimal temperature, and acclimation ability as proxies to evaluate the vulnerability of this species to climate change. So far, our ongoing study supports that a tropical amphibian can exhibit a wide tolerance range (~32 °C) and can acclimate to high and low temperatures. Despite their adaptive capacity to tolerate extreme temperatures, the temperature performance breadth closely matches closely the climate of the natural habitat with a narrow safety margin. The optimal physiological temperature, which is rarely available, seems to be a more reliable proxy to evaluate a species thermal sensitivity. Thus, our study highlights the importance of a comprehensive study on the performance curve parameters to be able to better understand the species thermal sensitivity and its vulnerability to climate change. The vulnerability of a species to a changing environment depends on its sensitivity, resilience, and its potential to adapt to change. Despite the complexity of factors contributing to an organism's vulnerability to climate change (e.g., dispersal, rainfall, disease, species interaction), a robust understanding of a species sensitivity and response to temperature is necessary.

THINKING INSIDE THE BOX: THERMAL SUITABILITY OF NEST-BOXES AND TREE-HOLLOWS FOR ARBOREAL MARSUPIALS

Jessica Rowland, Deakin University; Natalie Briscoe, University of Melbourne; Kathrine Handasyde, University of Melbourne

Hundreds of species rely on tree-hollows for shelter and breeding, however land-clearing has reduced their availability worldwide. Nest-boxes are deployed extensively in hollow-deficient habitats, but their thermal value for arboreal marsupials compared to tree-hollows is unclear, particularly in temperate environments. We analysed temperature regimes in nest-box and tree-hollow pairs during summer and winter in south-eastern Australia. Using a biophysical model, we quantified the relative suitability of den-sites for four marsupial species, estimating the impact of thermal microclimates (and ambient conditions) on predicted heat-production and heat-loss. Nest-box temperatures were strongly influenced by ambient temperatures and solar radiation, whereas tree-hollows buffered against external temperature fluctuations. On average, nest-boxes reached maximum temperatures 8°C higher than tree-hollows in summer and 3°C higher in winter, with maximum temperatures of 52°C recorded in nest-boxes, compared to 38°C in tree-

hollows. During summer, estimated heat-loss required by marsupials was 1.5-2.4 times higher in nest-boxes than tree-hollows. Conversely, predicted winter heat-production requirements were slightly lower in nest-boxes (0.95-0.97 of hollow requirements). Our results emphasise the importance of retaining tree-hollows as thermal refuges for hollow-dependent marsupials in temperate zones to reduce thermoregulatory costs during heat-events. Current nest-box designs are likely of limited value during high temperatures and solar radiation loads, however may provide suitable microclimates during winter. With increasing and more prolonged heat-events predicted under climate change, future conservation-management programs should focus on improving nest-box thermal properties to enhance suitability for wildlife.

TOOLS FOR THE CONSERVATION AND SUSTAINABLE MANAGEMENT OF USEFUL PALMS

Carolina Isaza, Universidad Militar Nueva Granada; Jaime Navarro, Universidad Distrital

Palms are a very important resource in the Neotropics region; however, the practices for its harvest cause disturbances in palm populations and in their conservation. Demographic models have been useful to project its sustainable use; nevertheless, in most cases, the results have not been extended to users' communities. In a review of 25 demographic palm studies and two case studies in Northwestern South America, we identified a set of management practices that promote its conservation. In general, populations were stable and the survival of adults and juveniles critical. Even so, since every species has particularities according to its life history, management, ecosystem and climate variability, the regulation for its use should be specific. In the case of *Iriartea deltoidea*, harvesters must pay attention to stem height and must sow juveniles. For *Mauritia flexuosa*, models show that fruit harvests should not exceed 30% /year, without felling. The regulations stated for these two palm products suggest different harvest quotas and management practices. The conservation and use of these resources could be successful if management is adopted. Finally, we presented examples of how management recommendations derived from research are an effective means to conserve palm resources when adopted by users' communities.

TRACKING WYOMING TOADS: LESSONS FROM REINTRODUCTIONS OF ONE OF THE WORLD'S RAREST VERTEBRATES

Luke Linhoff, Florida International University; Maureen Donnelly, Florida International University

There are approximately 202 species of amphibian in ex situ conservation programs. However, domestication processes associated with captive-breeding amphibians for reintroductions is unstudied compared to other vertebrate groups. In 1993, the Wyoming toad (*Anaxyrus baxteri*) was listed as extinct in the wild, but the toad survived in captivity. Reintroduction attempts of the Wyoming toad between 1995 and 2012 had limited to no success. The species is still considered one of the world's rarest vertebrates, and no self-sustaining wild population exists. We examined two main research questions that provide strong conservation management implications for amphibian reintroduction programs: 1) can acclimating toads to a release site improve establishment, and 2) how is the spatial ecology and behavior of captive-bred toads different from toads reared in the wild? In 2014 and 2015, we performed experimental reintroductions using captive-bred, adult Wyoming toads (N=46) at Mortenson Lake, Wyoming, USA. Toads were either hard released or soft released by acclimating in an outdoor enclosure for 14 days. Because no wild-born adults existed, adult toads (N=12) previously released as tadpoles were also tracked. All toads were fitted with a custom harness to externally attach a harmonic tracking device. Toads were tracked after reintroduction to compare activity patterns, survival and spatial ecology. Compared to hard released toads, soft released toads moved shorter daily distances ($p<0.05$), had slower dispersal rates ($p<0.05$), and increased burrowing behavior ($p<0.05$). However, all captive-reared toads had largely different spatial ecology and behavior compared to wild reared toads. We will report on comparisons between wild and captive reared toads including mortality, activity patterns, predation, and habitat use. Finally, ways for amphibian breeding programs to detect domestication processes that may be negatively impact reintroductions will be discussed.

TROPHIC CLASSIFICATIONS IN DIVERSE AMAZONIAN ECOSYSTEM FOOD WEBS: A NEW SUITE OF KEYSTONE SPECIES?

Pieter deHart, Unity College

The food webs supporting the ecosystems of the Amazon River are thought to be complex due to the high diversity and plasticity of foraging in tropical fish assemblages. Some studies have proposed piscivory as the most important driver structuring fish assemblages in the Neotropics, ultimately dictating ecosystem functioning and stability. The biome surrounding the Amazon, however, includes many unique ecosystems, ranging from alkaline macrophyte meadows to seasonal acidic floodplain lakes. Given this diversity, a universal approach in predicting how these ecosystems respond

to threats is ill-suited. To determine the true flow of nutrients within these systems, we collected samples of organisms throughout the food web in each of these habitats in the Amazon River of Brazil, identified the principal carbon sources, and reconstructed the food webs of these differing communities using stable isotope analyses. We then applied Bayesian mixing models to identify the relative contribution of potential prey items consumed by predators. Our results indicate that while macrophyte stands may serve as feeding grounds, they are not the general feeding source for most fish in Amazonian floodplains. There is a great diversity of autotrophic sources for fish, but these sources differ between acidic and alkaline rivers. Additionally, we suggest reclassification of the trophic status of multiple fish species previously assumed to be piscivorous to instead be considered omnivorous. Lastly, we identified food webs which are only slightly more complex when invertebrates are present, with chains shorter than previously assumed. Instead, some species or groups act as energy "hubs" in these habitats, and may be previously unidentified keystone species essential to ecosystem stability. Conservation is more likely to be successful if this new approach of hub-centric food webs is incorporated into models, with efforts focused on protecting the habitats and life-cycles of these species.

TROPHIC ECOLOGY AND DIVERSITY OF CARNIVORES IN THE HUMID TEMPERATE FORESTS OF SOUTHERN CHILE

Fernando Garcia Solis, Los Lagos University

This project is part of the eco-region of the Valdivian Rainforest, typical for high levels of biodiversity and endemism (part of the 25 biodiversity hotspots priority on conservation). More specifically, the study area is in the coastal temperate forests of Chile. The study aims to analyze the diversity of carnivorous mammals, at different levels of intervention. The methods selected are, game cameras, and the collection and analysis of feces. Others important aspects of this research are: The study of their trophic ecology, and the interactions between the different carnivorous. The predators studied are: Puma (*Puma concolor*), South American gray fox (*Lycalopex griseus*), Darwin's fox (*Lycalopex fulvipes*), kodkod (*Leopardus guigna*), dog (*Canis familiaris*) and the American mink (*Neovison vison*). Mention the importance about the potential finding of the Darwin's fox, which is a very rare, endangered and endemic species, whose presence was not recorded in the study area, but it is very likely to find it there. Another species to remark is the dog, because its presence is increasing, being a threat not only to native animals, also to livestock. Dogs compete directly with native predators, prey on native herbivores, and attack to livestock (making an important cost loss to traditional farmers and making worse the already complex conflict between local human population and wildlife). Furthermore, this project will study the conflict between local people and the puma, which cause a big loss in their traditional economies, and revenging actions against the puma. To achieve that goal, the feces collected will analyzed searching for livestock reminds, in addition a structured survey will be done. Finally, remark the big importance of the chosen study sites, as they are threatened areas with different levels of human intervention, with a high number of endemic species, and highly unknown. It will be the first steps to future conservation and management plans

TROPHY FISHING FOR SPECIES THREATENED WITH EXTINCTION: A WAY FORWARD

David Shiffman, University of Miami

Trophy fishing occurs when anglers target the largest members of a species with the goal of obtaining an award with perceived prestige. The largest members of many species are also the most fecund, raising alarms about the disproportionate impact of removing the largest individuals of species of conservation concern. Presented here is the first systematic analysis of the conservation status of fishes targeted for world records by the International Game Fishing Association. Eighty-five species for which IGFA records have been issued are listed as Threatened by the International Union for the Conservation of Nature (IUCN) Red List. If the IGFA stopped issuing records that implicitly require killing the fish for IUCN Red List Threatened species, it would immediately reduce fishing pressure on the largest individuals of species of conservation concern while still allowing anglers to target more than 93% of species that records have been issued for. This presentation will introduce the emerging conservation issue of trophy fishing for threatened species, and provide a timeline of efforts to stop this problem following the publication of an associated paper.

UNBUNDLING BETWEEN CONSERVATION AND POVERTY ALLEVIATION IN MEXICO: THE CASE OF LEPUS FLAVIGULARIS

Tamara Rioja Paradela, Universidad de Ciencias y Artes de Chiapas; Arturo Carrillo-Reyes, Universidad de Ciencias y Artes de Chiapas

In Mexico, some public policies initially aimed to biodiversity conservation have contributed in exacerbating environmental and social problems. An example of this situation is the endangered status faced by the endemic lagomorph Tehuantepec jackrabbit (*Lepus flavigularis*) and

also the condition of poverty in which "Ikoots" (huave) and "Binnizá" (zapoteca) indigenous communities live. The jackrabbit has not been adequately valued as an element of sustainable development in national, regional and local public policies, so an efficient program to manage in the long term the conservation of this lagomorph has not been developed. This complicated scenario has led to dispersion of conservation strategies, the lack of participation of communities in decision-making, the continuation of productive activities incompatible with ecosystems conservation, and a very limited legal framework. By the other hand, the lack of infrastructure and scientific advice for an adequate wildlife management has led to productive activities (fishing, livestock and hunting) that barely provide some sustenance to local families, resulting not only in a poor quality of life, but also in a direct repercussion on the Tehuantepec jackrabbit population. Currently, in one of the "Ikoot" communities (Santa María del Mar) we are carrying out the first study of local knowledge about the Jackrabbit and its habitat. Preliminary results indicate that although 89% (N=45) of the interviewees identify the jackrabbit and have knowledge about its habitat, diet, and social behaviour, and about its use as local food. However, the species is not among between the most valued for the community. It is important to establish greater links with the population to understand the intrinsic cultural value of this lagomorph.

UNDERSTORY INFLUENCE OVER TREE SAPLINGS IN NATIVE ARAUCARIA ANGUSTIFOLIA PLANTATIONS, ARGENTINA

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Forest plantations with native species are usually valued because their ability to hold species which belong to the original forest ecosystems, depending on its biotic and abiotic ecosystem characteristics (i.e., ground cover). The occurrence of native tree species saplings in plantations could conduce to their transformation into novel or restored ecosystems. The aim of this work was to assess the occurrence of native tree species saplings within plantations with a native species, *Araucaria angustifolia*, in northeastern Argentina, and correlated them with some plantation characteristics. Likewise, we characterized saplings (up to 0.8 m height) taxonomic and biometrically (root collar diameter-RCD and height). We worked in 75 linear transects 9 m long, evenly distributed in 15 plantations, identifying ground cover of debris-D and life forms (ferns-F, canes-C, Poaceae herbs-PH, non Poaceae herbs-nPH, climbing plants-CP and shrubs-S) by the point-intercept method up to 1.3 m in height. We performed a canonical correspondence analysis (CCA) to assess relations between sapling occurrence and ground covers. We found saplings in 43 of the 75 transects, belonging to 37 tree species, which vary from 0.1 to 1.9 cm in RCD and from 6.9 to 80.0 cm in height. CCA showed occurrence of *Ocotea puberula, O. diospyrifolia, Nectandra lanceolata, A. angustifolia, Allophylus edulis, Matayba eleagnoides* was more related to CP and nPH; *Prunus brasiliensis* occurred mostly under C and D; and *Guarea macrophylla*, *Cedrela fissilis* and *Sorocea bonplandii* preferred to growth under S. Occurrence of other species was not clearly related to any variable. The order of influence was D>C>S>T>nPH>CP>F=PH, where axis 1 (Eigenvalue 0.382) explained 36% variance, and axis 2 (Eigenvalue 0.232), 22% variance (58% with both). This information could be used to develop understory management practices to facilitate the installation and growth of native forest species within plantations.

UNUSUAL SUSPECTS: THE CONTRIBUTIONS OF CONSERVATION PROJECTS TO THE SUSTAINABLE DEVELOPMENT GOALS

Judith Schleicher, University of Cambridge; Bhaskar Vira, University of Cambridge

A key debate in conservation science has been the synergies and trade-offs that exist between meeting the aims of biodiversity conservation and development. This debate resurged as the international community agreed on meeting the ambitiously-articulated Sustainable Development Goals (SDGs) and associated targets by 2030. The SDGs cover a broad set of issues, emphasising the interconnectedness between the environmental, social and economic dimensions of sustainable development. From conservation perspective, this raises important questions concerning the existing links, trade-offs and synergies between biodiversity conservation projects and the SDG and its targets. However, so far little is known about what current conservation projects are already contributed towards the diverse set of SDGs. To address this gap, we reviewed a diverse portfolio of conservation projects funded by the Darwin Initiative and implement since 2012 by a range of conservation NGOs. For this purpose, we combined data form a questionnaire survey, an analysis of project documents and semi-structured interviews conducted with project managers. The study highlights the diverse range of contributions that conservation projects are already making towards the majority of the SDG's targets across all SDGs. It

also identifies areas of gaps and potential trade-offs in meeting different SDGs and conservation objectives. These findings have important implications for meeting the environmental, social and economic pillars of the SDGs and for mainstreaming considerations pertaining to biodiversity conservation into international development policy circles.

URBAN BIODIVERSITY AS A CONSERVATION OPPORTUNITY FOR INFORMAL SETTLEMENTS

Juliana Montoya, Humboldt Institute

We live in an increasingly urban world that puts an unprecedented pressure on ecosystems. This trend presents an urgent challenge on conservation of biodiversity, natural habitats and all the ecosystem services that society depends on. Unfortunately, the relevance of biodiversity and its benefits do not represent an immediate concern to more than a 900 million people living in slums whose main concern is where their daily food will come from as well as without basic services and with unhealthy living conditions. For that reason, the cities play a critical key role in conservation and use of biodiversity, where they define the existence of ecosystems. Therefore this research tries to integrate the urban biodiversity to territorial planning in slums through a comparative analysis of cities (Rio de Janeiro, Cape Town and Medellín), the study of planning tools and criteria and the proposal of "local actions for urban biodiversity" through their own dwellers that are the builders of their territory that can recognize the advantage of use and conservation of biodiversity in their livelihood like health, food safety, resilience, citizen participation. These actions are based on biodiversity tools to these communities looking to improve both the quality of life of residents, the neighborhood and the surrounding ecosystems city, and composed also by a toolkit that presents, to any inhabitant of an informal settlement, a wide range of opportunities and successful examples of integrating the challenges of poverty and degradation of our ecosystems.

USEFUL PLANTS OF COLOMBIA: A DATA-BASE FOR EXPLORING THE RELATIONS BETWEEN PLANTS AND PEOPLE

Nataly Pimiento Quiroga, Universidad Industrial de Santander; Andres Felipe Castaño, Universidad Industrial de Santander; Daniel Pabon, Universidad Industrial de Santander; Björn Reu, Universidad Industrial de Santander

For thousands of years people have used plants for a diversity of purposes, such as medicine, alimentation, construction or clothing, and have transmitted this traditional knowledge over generations. Colombia is both, biologically and culturally diverse. However, this diversity is currently threatened by deforestation, development, and the expansion of agriculture and extractive industries. The usefulness of the Colombian flora has only been partially documented and there's no systematic compilation that would allow an in-depth exploration about it. We used the recently published Catalogue of the plants and lichens of Colombia, and selected the 10100 arborescent species as backbone of the data-base. We compiled so far 4307 observations for 2298 tree species in 12 use categories from the literature. We found a total of 26869 uses, the distribution of which was analyzed over taxonomic groups, families and bioregions. Furthermore, we calculated ethnobotanical indices for identifying the most important families, taxonomic groups, bioregions and altitudes. The clade Rosids, the family Fabaceae, and the species *Oenocarpus bataua* exhibit the greatest number of uses. The use categories (1) Medicinal and (2) Construction were the most abundant ones in our sample and the bioregions of the Andes, Amazon and Pacific rank first when considering the total number of uses. The values for the ethnobotanical importance indices showed that the clade Monocots and the altitude between 1200 and 1800 m.a.s.l rank first. Interestingly, we found a strong relationship (R2=0.87) between the species richness of a bioregion and the total number of uses, suggesting that the most biodiverse regions are also those where species are used more by people. Our findings may serve to support the plants and people strategy as avenue for the conservation and sustainable use of Colombia's forests, especially when the continuation of this knowledge compilation becomes openly accessible and a community effort.

USING NOVEL TOOLS FOR COUNTRY-LEVEL REPORTING ON SPATIAL/TEMPORAL GAPS IN SPECIES OCCURRENCE RECORDS

Michelle Duong, Yale University

Species occurrence records as mediated through GBIF are essential for a detailed understanding of the distribution of biodiversity in space and time. Yet, despite an impressive recent growth and now hundreds of millions of records, the ability of this vast information to represent biodiversity and its spatial and temporal change has remained largely unquantified. Consequently, assessment of how well GBIF-mediated data represent species ranges or assemblage make-up over time, or how well-suited those data are for associated modeling and inference, requires information about an expectation: How well are mobilized data actually representing expected taxonomic, spatial, and temporal variation in biodiversity? The GBIF coverage assessment that we present here are a suite

of novel informatics tools and web services that report on spatial and temporal data gaps, as well as biases among countries. They characterize the coverage of data mobilized for a given species group, country and year by setting it in relation to expert expectation across a standardized grid using two metrics: assemblage-level coverage and species-level coverage. The concepts behind our metrics have been have been endorsed as sound quantification of species occurrence data gaps ("Species Status Information Index") by GEO BON, and recently IPBES and the Convention on Biological Diversity. We designed these tools with components embeddable in partner websites and with the potential of automated country reports that can be built out to update near-real-time. Information about gaps and biases in this GBIF-mediated data coverage, and how successful countries and their institutions are in addressing them is vital. It can help identify priority targets for data collection and mobilization. In gridded from, coverage maps inform about the reliability of available evidence for a species group and can be used to account for spatial biodiversity ignorance in species distribution modeling and related

USING POLLINATION SERVICES FOR SPATIAL CONSERVATION PRIORITIZATION IN AGRICULTURAL LANDSCAPES

Sofia Lopez, University of Queensland, School of Earth and Environmental Science; Eve Mcdonald-madden, Dept Sustainability & Environ; Rebecca Runting, The University of Queensland

Pollinators are essential for ecosystem dynamics and also for human wellbeing, since they support the reproduction of almost 80% of wild plants and around 35% of global crops. Increasing pollinator abundance and richness is considered essential to raise the productivity of existing croplands. While previous studies have incorporated pollination services to identify areas that can both increase the presence of pollinators and biodiversity conservation, they have failed to capture the benefits of this for agricultural productivity. Capturing the economic benefits of such services is essential as it could influence the attitudes of stakeholders towards preserving natural habitats. In other hand, other studies have quantified the economic benefit of surrounding forest for pollination services, but they do not analyse which forests could improve biodiversity conservation spatially. In this study we focus on spatial planning for land use that captures both agricultural benefits and biodiversity targets and investigate the importance of pollination services for achieving both objectives. We used Integer Linear Programming to investigate land use under four different scenarios to improve land use decisions in Costa Rica that both enhance coffee productivity and conservation outcomes, 1) to maximise coffee production without considering pollination, 2) to maximise coffee production and biodiversity without considering pollination, 3) to maximise coffee production incorporating pollination services and 4) to maximise both biodiversity and coffee production with pollination services incorporated. Our work highlights the extent to which pollination services could impact landscapes in areas reliant of agriculture and allows for land use planning that captures both conservation initiatives and the needs of locals for agricultural productivity. Our results also serve as a tool for engaging local land-holders in conservation endeavours that can enhance.

VISUAL ART AND CONSERVATION BIOLOGY: PARTNERS ADDRESSING THE CRISIS OF DIMINISHING BIODIVERSITY

Jeanne Dodds, Endangered Species Coalition

My poster submission represents an evaluation of ways in which illustration and photography effectively and clearly serve as mechanisms to express, communicate, and inspire action for conservation of biological diversity. In particular, I will discuss and assess common methods and aims threading across these fields, identifying mutual goals that facilitate interdisciplinary relationships between conservation biology and visual art forms. Specific perspectives shared by conservation biology, illustration, and photography will be emphasized, including: the concept that evidence-based positions about issues of significance demand open expression (in particular noting the unique identification of conservation biology as a mission driven science); identification of shared objectives is critically important within these disciplines, especially toward the goal of message amplification by using different channels to express similar goals; and how both arenas can inform and influence perspectives of policy makers, scientists, and non-specialist audiences. This poster presentation will focus on establishing common ground between these disciplines to bridge gaps in understanding, in particular between practitioners of these fields and individuals or groups alienated by the professional, stylistic and linguistic traits characteristic of one or both disciplines. This project asserts that photography and illustration are uniquely positioned to daylight and provide critical awareness of biological conservation issues with limited presence in the public sphere, in particular, wildlife trade. To that end, the work will examine how the visual art forms in question are especially suitable for generating interest in important but under-recognized conservation problems in an immediate,

visceral, and impactful way, especially ideas difficult to explain via other expressive forms.

VISUALIZING PROTECTED AREA LEGAL CHANGES AND DEVELOPMENT DYNAMICS IN AMAZONIA

Rachel Golden Kroner, George Mason University; Thomas Lovejoy, George Mason University; Michael Mascia, Conservation International; Shalynn Pack, Round River Conservation StudiesSiyu Qin, Conservation International

Protected areas are the cornerstone of biodiversity, safeguarding ecosystem services and biodiversity worldwide. In recent decades, protected area coverage has increased in response to the Convention on Biological Diversity's Aichi Target 11. However, gains in coverage have been offset by legal changes to weaken, shrink and eliminate protected areas. These legal changes are collectively known as PADDD: Protected Area Downgrading, Downsizing, and Degazettement. Information on protected areas and PADDD is often presented as a static map (e.g., the World Database of Protected areas and PADDDtracker), but this presentation format fails to communicate temporal dynamics. To display data in a dynamic way, we created a video map of protected areas and PADDD events in Amazonia by combining spatial data in ArcGIS. We also included data on forest cover change, mining concessions, hydrocarbon blocks, and infrastructure to visualize spatial patterns of protected areas in the context of development. The map focuses on Amazonia because of the region's importance for biodiversity and accelerating development pressures. To date, 170 PADDD events (102 enacted and 68 proposed) have been documented in Amazonian countries; the map can be updated as additional PADDD events occur. The map shows that although many protected areas were established recently, development has accelerated and the rate of PADDD events has increased since 2000. This video map is a unique tool that can be used to prepare for impact evaluation of protected areas and communicate information with stakeholders. The tool can also be applied to different regions, data sets, and contexts. This poster will present highlights of the map and a Quick Response (QR) code linking to the video map. The poster will also be accompanied by a computer to display the video map during the poster presentation session.

WHERE TO SEE GRASSLAND SPECIES IF GRASSLANDS ARE GONE?

Mari-Liis Viljur, University of Tartu, Department of Zoology; Tiit Teder, University of Tartu, Department of Zoology

Contemporary managed forest landscapes contain various novel types of open habitats which are potentially suitable for early successional species, including species traditionally considered to inhabit semi-natural grasslands. However, systematic analyses identifying the share of regional species pool that can take advantage of this alternative are scarce. We assessed the importance of man-made forest openings for open-habitat butterflies in Northern Europe by comparing butterfly species richness and composition in forest clear-cuts with their regional species pool. The species richness of butterflies in clear-cuts appeared to be remarkably high: we recorded the vast majority of the regional species pool in just 37 sites surveyed. The list of recorded species contained as high as 79% of regionally occurring grassland species, as well as nearly complete sets of open-habitat generalists and forest species. Different forest types harbored characteristic butterfly assemblages, their contribution to the butterfly fauna of forest landscape being thus complementary. Our findings demonstrate that novel man-made forest openings can considerably mitigate the detrimental effects of the loss of semi-natural grasslands. Human-altered ecosystems may thus prove to be a viable alternative where restoring or maintaining natural and semi-natural habitats is impossible.

WILDLIFE CROSSINGS IDENTIFICATION FOR ROAD DEVELOPMENT IN GUYANA

Evi Paemelaere, Panthera; Curtis Bernard, Conservation International Guyana; Esteban Payan, Panthera; David Singh, Conservation International Guyana

Expanding road networks pose a prime threat to the Guiana Shield biodiversity, where wildlife has mostly remained protected through inaccessibility. We conducted a study on wildlife crossings in Guyana as part of a pre-investment study on the upgrade of the Linden-Lethem Road (LLR). This 438km stretch is the only unpaved road section connecting metropolis Manaus (Brazil) to the Atlantic Ocean. LLR bisects Guyana and provides the main access to the country's hinterland, traversing logging, mining, agriculture, settlements, biodiversity conservation areas and tourism regions. For our short-term study in May-June 2014, we prioritized road sections based on vegetation and land-use, selecting a seasonally flooded savanna and an adjacent protected forested site. Previous research here had demonstrated vast mammal richness. Based on surveys of scat, road kill, live sightings, and camera traps under bridges, and existing life sighting and road kill data from 6 years in Iwokrama, we identified two major crossing locations in the savannas, while for the protected forest animals crossed randomly. Under-passage use was negligible. Road kill rate - 0.0048 individual

mammals killed per kilometer of savanna road surveyed (0.64 kills/24hrs) - was very low compared to other records from unpaved and paved roads in the Neotropics, but followed similar patterns in species vulnerability. While the most common terrestrial mammals were found to have the highest road kill rate, such patterns were absent for other species, and based on findings in similar habitat, there is real concern for the giant anteater, as well as for species for which the road will become a movement barrier. We recommend speed limit reduction measures at the identified crossing points, and continuation of the no-night-driving policy within Iwokrama. We discuss challenges to mitigate secondary impacts of the LLR upgrade in Guyana.

WOMEN IN CONSERVATION: CHALLENGES FACED FOR CONDUCTING FIELD RESEARCH IN PERU

Rocio Lopez De La Lama, Universidad Peruana Cayetano Heredia

Peru is a biodiverse and multicultural country, with incredible potential for conservation field research. However, Peru has great gender disparity among the scientific community; 30% of all researchers and university teachers are women. Gender equity is key for quality research, especially in the conservation field were applied and social sciences work together, and a variety of perspectives are needed. In this context, challenges faced by Peruvian female scientists interested in field research need to be identify and understand. To achieve our research objective, we interviewed 34 scientists, 23 females and 11 males, from the social and applied sciences. The interviewees included a variety of professions, age groups and were in different stages of their professionals' life. Our findings can be divided in: challenges for studying a not-conventional female career, challenges faced to access and conduct fieldwork, and strategies women develop for doing fieldwork. These barriers are encountered since undergraduate and are more difficult to surpass as a young female researcher. In addition, these have internal (related to family and home responsibilities) and external origins (related to institutions and social norms). Although men and women struggle to do research in Peru (in terms of securing funding, safety and adequate job conditions), women tend to face more demotivating scenarios and are more vulnerable to mental and physical risks. This research sheds light on the challenges surpassed by strongly motivated women to do conservation. Despite this being a Peruvian study, these findings are relevant for other developing and male-dominated societies. Furthermore, the challenges here explored are relevant to all women interested in field research, many of which cannot surpass the identified barriers. Thus, this study identifies key challenges and factors that need to be taken into consideration for closing the gender gap in conservation worldwide.

A GLOBAL SAMPLE TO EXPLORING OUR PROGRESS TOWARDS EQUITABLY MANAGED PROTECTED AREAS

Noelia Zafra-Calvo, Center for Macroecology, Evolution, and Climate, University of Copenhagen

Although Aichi Target 11 stressed that is essential to incorporate social equity in the management of protected areas, still we do not have enough evidence in our progress towards achieving equitably managed protected areas. We asked to 241 protected areas managers, NGOs staff and communities' representatives their perception about 10 equity criteria defining equitably managed protected areas. Our results show a global picture where it is necessary urgent action to improve the participation of all stakeholders in decision-making processes about the management of the site; as well as paying more attention to the ability to access to justice in the resolution of conflicts and the recognition of rights, cultural identities and traditional management practices of local stakeholder groups. Protected areas with sustainable use of natural resources and shared governance perform relatively well in achieving social equity. We suggest a focus on improving governance and recognition aspects of social equity for critical improvements at site level and a mayor number of equity assessments for necessary advances at global policy level.

A POPULATION VIABILITY ANALYSIS OF GREEN ASH WITH EMERALD ASH BORER SCENARIOS

Rachel Kappler, Bowling Green State University; Karen Root, Bowling Green State University

Understanding ecological recovery following extreme invasion events is critical for preserving our natural resources. The introduction of the invasive emerald ash borer (EAB) (*Agrilus planipennis*) to North America has caused significant ash (*Fraxinus spp.*) decline and cascading forest dynamic changes. Northwest Ohio has had almost complete adult ash mortality in natural areas, leaving a remnant cohort of younger ash seedlings and saplings. Ash trees are an important part of the floodplain forest, serving as a soil stabilizer, and to sustain these populations we need more information on their probability of persistence. Utilizing a population viability analysis, which identifies critical factors (e.g., vital rates, environmental factors) that influence long-term viability of vulnerable species, we can explore management strategies that prevent further endangerment and the natural recovery process. We developed a stochastic stage-based population model for natural stands of green ash trees and examined potential future scenarios of management improvement for the next 50 to 100 years. We collected vital parameters from the scientific literature and USDA Forest Service field data at Oak Openings Preserve, Swanton, OH. Potential management actions involve detection and removal of EAB, and planting of EAB resistant ash, which increases the stands survival. Our results indicate that population changes were more sensitive to survival and growth of the small stages (<1 cm dbh). Scenarios where EAB was present at current levels and there were no management actions resulted in local ash extinction before year 50. A 30% improvement of ash survival for all stages doubled the time until extinction. These results highlight the critical factors that ash management needs to improve the current situation. This approach can be valuable in developing effective conservation strategies for the recovery of native species in the face of invasive species.

ADAPTATION OF VEGETATION TO FUTURE CLIMATE CHANGE IN HIGHLAND SITES IN SOUTHEAST ASIA

Fanny Langerwisch, Potsdam Institute for Climate Impact Research; Alice Boit, Potsdam Institute for Climate Impact Research; Boris Sakschewski, Potsdam Institute for Climate Impact Research; Kirsten Thonicke, Potsdam Institute for Climate Impact Research; Tomas Vaclavik, UFZ - Helmholtz Centre for Environmental Research; Werner von Bloh, Potsdam Institute for Climate Impact Research

Climate change alters the distribution of vegetation worldwide. To understand the underlying consequences for contemporary ecosystems is of crucial importance for nature conservation. The increasing temperatures drive plants to higher altitudes. Since the space for plant growth gets smaller in higher altitudes there is a need to estimate how far plants will move and how they can adapt to the changing conditions. Little is known about the shifts in vegetation's characteristics. Therefore, we assess the changes in spatial plant distributions and community composition with a new trait-based dynamic global vegetation model under a suite of climate change scenarios. We show for three highland areas in Southeast Asia that under future climate change temperate plants will be replaced by tropical vegetation on the mountain tops, while the tropical forests in the valleys will shift towards a more grass-dominated vegetation type with a less dense forest structure. We also show that the characteristics of the vegetation will shift, e.g., decreasing specific leaf area (SLA) and increasing wood density (WD). While the movement uphill has already been measured the combination of the shift in composition of vegetation (more grass, less trees) with the plant's characteristics (e.g., lower SLA values) adds new insights to the estimation of ecosystems' reaction to climate change. This might be of special importance for designing protection zones for tropical forests.

AN INTERDISCIPLINARY ASSESSMENT OF THE DRIVERS DETERMINING TOLERANCE OF LARGE CARNIVORES IN ROMANIA

Peter Damerell, The University of Cambridge

The ecology and behaviour of many large carnivores predisposes them to negative interactions with humans. The typical response has been lethal control, resulting in substantial range contractions. The effective conservation of large carnivores therefore requires both a suitable biological and anthropogenic landscape. It has been demonstrated that the amount of damage a species inflicts on an individual poorly predicts their willingness to coexist with the species. This study aims to determine how 25 hypothesised drivers of tolerance influence individuals' behavioural intentions towards three European carnivores Lynx lynx, Canis lupus and Ursus arctos. 871 semi-structured interviews were conducted within rural Romanian households in three study areas. The focal carnivores have been extirpated from one area for more than a hundred years whilst the two adjacent areas have supported the continuous presence of substantial populations. Initial univariate analysis indicates strong associations between individuals' behavioural intentions towards a species and the trust an individual place in the managing agencies. Perceptions of the risks and benefits a species poses, personal vulnerability to economic losses and affect for the species also show strong correlations with behavioural intentions. A structural equation model is being finalised to describe the significance of and interactions between hypothesised drivers of behavioural intention. Alongside the quantitative assessment, discourse analysis of qualitative responses is ongoing and will be used alongside differences in the species ecology and behaviour to explain observed variations in individuals' behavioural intention towards each of the three focal species. Determining the drivers of tolerant attitudes and behaviours in communities is vital for the effective implementation of initiatives designed to conserve carnivores within their current ranges and re-establish their presence into historic areas of habitation.

ANTICIPATING FUTURE CHANGES TO CONNECTIVITY IN MARINE PROTECTED AREAS

Melinda Coleman, NSW Department of Primary Industries; Paulina Cetina Heredia, University of New South Wales; Ming Feng, CSIRO; Brendan Kelaher, Southern Cross University; Moninya Roughan, University of New South Wales; Erik van Sebille, Imperial College London

Ocean currents are projected to be altered under future scenarios of climate change. As these currents often influence dispersal and connectivity among populations of many marine organisms, changes to currents may have dramatic implications for population persistence. Networks of marine protected areas (MPAs) often aim to maintain connectivity but anticipation of the scale and extent of climatic impacts on connectivity is required to achieve this critical conservation goal into the future. For 2 key marine species (kelp and sea urchins) we use oceanographic modelling to predict how continental boundary currents are likely to change connectivity among a network of MPAs spanning over 1000 km of coastline off eastern Australia. Overall change in connectivity did not exceed temporal variation within climatic scenarios, highlighting the need for future studies to incorporate temporal variation in dispersal to robustly anticipate likely change. However, the intricacies of connectivity between different pairs of MPAs within the network were noteworthy. Poleward connectivity of kelp tended to increase in the future whereas equatorward connectivity tended to decrease. In contrast, for sea urchins, connectivity among pairs of MPAs generally decreased in both directions. Self-seeding within higher-latitude MPAs increased and the role of low latitude MPAs as a sink for urchins changed significantly in contrasting ways. These projected changes have the potential to alter important genetic parameters with implications for adaptation and ecosystem

vulnerability to climate change. Considering such changes, in the context of managing and designing MPA networks, may ensure that conservation goals are achieved into the future.

AQUATIC BIODIVERSITY PROFILING AND MONITORING IN NEPAL USING EDNA TECHNOLOGY

Karolyn Upham, USAID; Dibesh Karmacharya, Center for Molecular Dynamics Nepal

The aquatic ecosystems of Nepal offer excellent habitats for at least 186 indigenous and 11 exotic fish species of high economic, environmental and academic value. They are distributed from the lowlands of Terai and through the hills to the Himalayan Mountains. They inhabit rivers and lakes of mid hills and mountains, with water temperature range of 10°C - 20°C. Knowledge of species distribution and ecology is critically important to ecological management and conservation biology. Effective management requires the detection of existing populations in designated systems, which inhabit on minimal densities due to various imposing factors and is usually based on visual detection and counting. However, unlike their terrestrial counterparts, relatively little is known about native fish and other aquatic organisms in Nepal. Information on the distribution of native fish in Nepali rivers is limited; and there is a paucity of knowledge about the ecology, genetic and evolutionary history of various native and invasive species, including those important to people and environment. Nepal Fish Biodiversity Project (NFBP) is a research study which focuses on the creation of native fish biodiversity of Nepal and aims to create first fresh water fish genetic database using environmental DNA (eDNA) meta-barcoding technology. NFBP is a two-year feasibility research project which aims to develop eDNA technology to build knowledge on the distribution and ecology of native fish in designated Karnali river basins in Western Nepal. The project has started collecting fish species of the Karnali river, and has been doing morphological and genetic analysis to identify the species. Subsequently, from collected water samples, the project aims to identify species presence using eDNA technology.

ARE WE CONSERVING THE HABITATS REQUIRED BY MIGRATORY SHOREBIRDS ADEQUATELY AT THE LOCAL LEVEL

Chi Yeung Choi, The University of Queensland; Richard Fuller, University of Queensland; He-Bo Peng, University of Groningen

Establishing protected areas at key stopping sites is regarded as an important mean to halt migratory shorebird population decline along the East Asian–Australasian. However, many of the existing coastal protected areas in China were established more than a decade ago, when our understanding of the local movement and the needs of shorebirds was limited. In this study, we investigated the effectiveness of current zoning system of the coastal wetland reserve by overlaying the home ranges of Great Knot *Calidris tenuirostris* (EN) in the Yalu Jiang National Nature reserve with the functional zone of the reserves. From the radio tracking data, we found only 28% of the home range (95% kernel density) of Great Knots fell into the core zone, while most of the home range fell into the buffer and experimental zone, with 10% fell outside the reserve boundary. During high tide (± 2 hrs of high tide), only 3-11% of the Great Knot fixes fell into the core zone, with 13-17% fell outside the reserve boundary. In contrast, during low tide (± 2 hrs of low tide), all fixes were recorded within the reserve and 37-75% of the fixes fell within the core zone. These indicate that the low tide foraging areas are relatively well protected while high tide roosting areas are inadequately protected. To conserve the shorebird habitats thoroughly, it is therefore important to identify these high tide roosting habitats in important shorebird sites and include them when establishing new protected areas, or work with local land owners if these habitats fall outside an established reserve's boundary.

ART, MAGIC AND RELIGION IN FAVOUR OF AMAZON CONSERVATION

Marco Carpio, CORBIDI

In 2009, swathes of deforestation caused by illegal gold mining became visible between kilometers 108-160 of the interoceanic highway that cuts through the Manu-Tambopata biological corridor in the Amazon of Peru. Since then I observed the usual chaos that reigned this area turned to silence during June because miners go on pilgrimage to the Ausangate mountain to celebrate the festivity of the Lord of Qoyoritty (LoQ). I found this devotion contradictory because the LoQ is well-known as the festivity of water purification and the miners who go on pilgrimage pollute its waters with mercury in lowland Amazon. I created an artwork to provoke a deep reflection in the magic-religious subconscious of these miners from Andean origin, in order to help mitigate the social-environmental disaster caused by mining. The project involved circulating traditional religious stamps containing a prayer where a miner asks the LoQ for forgiveness for offending him by polluting his waters with his work. It also involved the clandestine installation of two crosses of the LoQ, one installed in the mining area and the other at church in the city of Puerto Maldonado. The crosses had an emblem that read "I cry for these dead lands and

waters" and held the same prayer of the stamps. The cross installed in the church is still there and is adored daily by the devotees of the LoQ, including miners. The cross that was installed in the interoceanic highway, where illegal miners operate, was venerated with flowers from the first day, but unfortunately someone innocently revealed the authorship of the cross in Facebook and the cross was destroyed the next day. This project was not conceived originally as science but as artwork, so no measures were taken to assess the impact of the intervention. Yet, the outcomes give us lessons on the importance of interdisciplinary projects that use art to disseminate conservation messages, and on the potential of art and religion as agents of conservation.

ASSESSING CONSERVATION EFFECTIVENESS OF PROTECTING TIGERS IN THREE TIGER RANGE COUNTRIES

Sumaiya Firoze, USAID Bangladesh, study leave; Masters on Environmental Conservation, UW-Madison; Terilyn Allendorf, University of Wisconsin; Janet Silbernagel, University of Wisconsin; Karl Wurster, USAID

The Global Tiger Initiative estimates that only 3,890 tigers remain in the wild. Among them, the Bengal tigers are found in Bangladesh, India, Nepal and Western Myanmar. Per the 3rd Asia Ministerial Conference on Tiger Conservation, held in April 2016, the total number of tigers in Bangladesh, India and Nepal are 106, 2,226 and 198 respectively (WWF 2016). Each of these countries have distinct cultures and practices of conserving tigers. This study compares the approaches used to conserve tigers in three tiger range countries – Bangladesh, India and Nepal. Information gathered through key informant discussions, action plans and implementation strategies used to conserve tigers will be used to analyze the key factors needed for successful tiger conservation intervention. As a result of this study, key recommendations and lessons will be consolidated from three tiger range countries that can support future tiger conservation activities. The objective of this presentation will be to share the technique of assessing conservation effectiveness and tiger conservation lessons gathered from a multi-stakeholder group comprising of tiger experts, conservation practitioners, scientists, social scientists, communication and outreach experts, government representatives, civil society, community members and donors.

ASSESSING KNOWLEDGE AND ATTITUDES TOWARDS WILDLIFE IN A BIODIVERSITY HOTSPOT

Daniela Poo Muñoz, Universidad Santo Tomás; Francisca Astorga, Fundación Pulso Ambiental; Gonzalo Medina Vogel, Universidad Andres Bello; John Organ, U.S.G.S. Cooperative Fish and Wildlife Research Units

Human dimension in conservation is especially important in sub-urban areas where encounters with wildlife are frequent. In this context, carnivores are particularly vulnerable to human-wildlife encounters, as carnivores can have conflicts with humans through depredation of domestic animals. We aimed to determine factors associated with people's knowledge and attitudes towards three native carnivores in Chile: lesser grison (*Galictis cuja*), culpeo fox, and chilla fox (*Lycalopex spp.*), in human settlements surrounding the natural reserve Altos de Cantillana (NR), located in the Chilean Mediterranean biodiversity hotspot. We developed 170 face-to-face interviews, using Likert scale to assess attitudes, and open-ended and close-ended questions for knowledge. Attitudes were analyzed through factorial ANOVA. Lesser grison was poorly recognized by inhabitants (16%), and exotic species were best recognized than native ones. Personal attitudes towards wildlife in general and foxes were positively influenced by: (1) higher education levels, (2) closeness to the NR, and (3) lack of experiences with depredation/attacks of domestic animals. Nevertheless, for lesser grison, negative attitudes were high, and associated with elderly, people that had previous encounters with the species, and those who had experienced poultry depredation. From the respondents that owned poultry, 44.9% reported poultry depredation. Interestingly, these attacks were done by free-ranging domestic dogs in most of the cases (74.1%). It is critical to inform people in this area about the ecosystem services provided by cryptic and non-charismatic native carnivores, such as the lesser grison. High poultry depredation by domestic dogs plays a key role in the negative attitudes of people against wild carnivores due to misidentifications of the attacker, triggering human-wildlife conflicts in Chile.

ASSESSING THE EFFECTS OF CONSERVATION INCENTIVES ON PRIMATES ACROSS FOREST FRAGMENTS IN COSTA RICA

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Efforts to preserve remaining tropical forests and threatened species dependent on them have largely focused on creating protected areas. However, citizens often rely heavily on natural resources for subsistence, and environmental laws are regularly breached. As a result, conservation policies have evolved from exclusionary protected areas to strategies that focus on local communities by providing economic incentives. Despite increasing promotion of community-based alternatives, little evidence exists that they are any more effective than protected areas at maintaining forest quality or sustaining nonhuman primate populations. Therefore, we examined how policies integrating conservation and development objectives, such as ecotourism, carbon offset programs, academic research activities, and multiple-use protected areas, influenced a series of 24 tropical forest fragments and their nonhuman primates at and surrounding the Organization for Tropical Studies' Las Cruces and La Selva Biological Stations, Costa Rica. We conducted a census of primate populations using line transects, measured pollution using passive air samplers and soil test kits, quantified forest characteristics, including size, canopy cover, diversity of trees, and abundance, productivity, and recruitment of fig trees, examined microclimate variation, and conducted interviews and surveys of local communities. Our results indicated that incentives for forest protection influenced abiotic conditions, forest structure, and primate abundance. These results contribute to knowledge of how policies integrating conservation and development objectives affect tropical forests and their nonhuman primates. By understanding how human activity influenced by economic and participatory incentives directly and indirectly affects nonhuman primate populations, we will be able to improve restoration practices through promotion of ecosystem services provided by these species, including seed dispersal and fig recruitment.

ASSESSING WHETHER EXISTING SHALLOW REEF FOCUSED MANAGEMENT PROVIDES PROTECTION FOR MESOPHOTIC REEFS

Erika Gress, Conservation Leadership Program; Maria Arroyo-Gerez, Conservation Leadership Programme; Dominic Andradi-Brown, University of Oxford

Coral reefs are facing unprecedented threats caused by local and global human impacts. Recent research has indicated many threatened reef species exist across wide shallow (<30 m) to mesophotic (30-150 m) reef depth gradients, and a rapidly increasing mesophotic reef ecology literature base highlights the potential refuge roles of mesophotic reefs aiding overall reef resilience. Despite this, reef conservation remains heavily focused on the shallows, with little understanding of how current reef management approaches affect deeper reefs. This study, conducted in Cozumel, Mexico, evaluates the effectiveness of the National Marine Park (MPA), which was originally designated based on shallow reef data, on both shallow and mesophotic reefs. We report that while current management has detectable effects in shallow reef benthic and fish communities, we find little difference at mesophotic depths. Our results suggest for some economically important species, such as black corals, mesophotic reefs are acting as natural refuges despite limited management efforts. However, our results also show that large-bodied fish are depleted on mesophotic reefs (including inside the MPA) compared to other regional mesophotic reefs. Therefore, it is important that future updates to the marine park management plan should consider explicitly expanding fisheries protection to mesophotic reefs. Our work is providing scientific evidence that will assist in filling these gaps and in collaboration with the MPA managers we aim to integrate mesophotic reefs into current management.

BEHAVIORAL ANALYSIS OF TIGER SALAMANDER (AMBYSTOMA CALIFORNIENSE) MIGRATION THROUGH ROAD TUNNELS

Tracy Bain, International Fund for Animal Welfare

Road networks cut through ecosystems causing habitat fragmentation, genetic isolation, and wildlife mortality. Wildlife crossing structures are used often as a solution to overcome this growing problem, but are frequently installed without further study on the features that can influence their efficacy. We addressed this issue by investigating the effects of several abiotic and biotic factors, including precipitation, ambient temperature, humidity, sex, size, and within-tunnel moisture levels, on the movement of endangered California Tiger Salamanders (*Ambystoma californiense*) during their annual migration. We examined the effects of these factors on the rate of tunnel completion and the time it took individuals to traverse a tunnel, with an experimental focus on within-tunnel moisture. Seventy-seven individuals were examined in this study, and 39 of these individuals passed through the tunnels regardless of moisture levels. Our results showed that within-tunnel moisture levels had no significant effect on the probability of tunnel crossing completion or rejection, but did have an effect on crossing time, resulting in individuals spending ~20% less time traveling through wet tunnels as compared to dry tunnels. Among the other factors evaluated, only precipitation increased the probability of completions and decreased

crossing time through tunnels. Our findings suggest that internal moisture levels have little effect on the use of road tunnels and the migration of *A. californiense*. Rather, external precipitation largely drives tunnel usage and migratory behavior. Nonetheless, our study demonstrated the successful use of wildlife crossing structures in safely facilitating *A. californiense* under a hazardous roadway.

BETA DIVERSITY OF ARTHROPODS ACROSS THE COMPLEMENTARY ZONES OF THE KOGELBERG BIOSPHERE RESERVE

Julia van Schalkwyk, Stellenbosch University

Biosphere reserves aim to bridge the gap between human development and biodiversity conservation. This is done through the designation of zones with specific functions (core zones for biodiversity conservation, transition zones for sustainable human development, buffer zones for integrating biodiversity and development). This work assesses the effectiveness of these different zones for biodiversity conservation. The study area is the Kogelberg Biosphere Reserve (KBR) that is a floral hotspot within a hotspot (the Cape Floristic Region), yet falls within one of South Africa's major pome fruit producing regions. For biodiversity conservation to be effective, areas under conservation management need to represent the known diversity of an area, and this needs to be sustained in the long run. We here determine whether KBR arthropod beta-diversity tracks floral diversity and what role topographic factors relating to microclimate can play in mitigating the adverse effects of climate change. One of the functions of the buffer zone is to protect core areas from activities within the transition zone. Understanding the impact of pome fruit farming on diversity in adjacent natural vegetation will guide future land planning within these areas. Knowledge of the impact of management practices within commercial orchards (related to vegetation between tree lines) can guide future management aimed at promoting local diversity (and in particular beneficial arthropods (predators of pests)).The buffer and transition zones may also further add to conservation by conserving suites of complementary species not present within the core zone. Biosphere reserves are novel systems that are being shaped by the interaction between man and the environment. This work will help us understand how human activities affect diversity within a biosphere reserve.

CHARACTERIZATION OF THE BIRDS PRESENT IN THE ISLANDS OF THE DISTRICT OF CARTAGENA, BOLÍVAR, COLOMBIA

Harold Gomez, University of Cartagena

To study the relationship between habitat and avian diversity is an important basis of conservation planning because helps to know the abundance and richness of avian species in the ecosystems. Colombia is currently recognized as one of the countries with the highest diversity of birds in the World. The aim of this study was to determine the composition and structure assemblage of birds associated to the ecosystems founds in the archipelago belonging to the district of the Colombian Caribbean city of Cartagena (10°10Ψ30ΨN - 75°45Ψ00ΨW). The first part of this research consisted in characterize the wild local birds using the method of fixed points (11 randomly choose points were located along the tropical forest). The species were identified through direct observation, and singing records (GEUPEL, et al., 1997). 42 species of birds were found in 22 families. Threatened species like *Patagioenas leucocephala* was found to be the most abundant specie, followed by Coragypsatratus. Also, we report the presence of *Quiscalus mexicanus* and *Quiscalus lugubris* as well as 6 species of the family Tyrannidae. This preliminary result become the first report done at the tropical forest found in these islands, and will help in the stablishing of a future basic management plan of native and foreigner avian species of Cartagena city. We would like to thanks to the Community Council of Islas del Rosario-Cartagena, National Parks of Colombia, Colciencias and the University of Cartagena for the encourage and financial support to this project (Supported by the Grant No. 484 of 2016).

CITIZEN SCIENCE REVEALS EFFECTS ON BIRD COMMUNITIES BY DEFORESTATION IN NORTHWESTERN AMAZONIA

Orlando Acevedo-Charry, GOUN; Brayan Coral-Jaramillo, Putumayo Birding; Paul Furumo, University of Puerto Rico; Ottavio Janni, Independent; Flor Angela Peña, Grupo de Observadores de Aves de Leguízamo; Diego Rocha Lopez, Grupo de Observadores de Aves de Leguízamo

Tropical forests continue to be deforested around the world. A key question is how deforestation will affect biota on a finer scale and how humans can mitigate these effects to conserve biodiversity. Here, we use a community-based monitoring tool to assess the negative effects of deforestation over 30 years on the assemblage of birds in the Putumayo-Caquetá interfluve region in Colombia, northwestern Amazonia. We use the eBird platform to extract the presence of bird species in 20 points in this region. Each point was composed by combination of eBirders checklists inside a circumference of ratio 500 m. In addition, we estimated the deforestation rate for our study site between 1984-2014, using Landsat images. Based on our results, the assemblage of birds is related with the

amount of forest, changing drastically from the reference Amazonian forest to the open human modified landscape. This anthropogenic land change has allowed colonization of open country birds, such as Orinoquian representatives, following the deforestation front in southern Colombia. Social and political proactive conservation efforts should be initiated in the northwestern Amazon region before the current Colombian post-conflict dynamic and rural development initiatives open up more natural habitat to human activity. We advocate local citizen science as an effective way to monitor and conserve this tropical biota.

CITIZENS BATS: UNCOVERING THE DISTRIBUTION, HUMAN-BAT INTERACTIONS AND PERCEPTIONS ABOUT FRUIT BATS

Kofi Amponsah-Mensah, University of Ghana; Andrew Cunningham, Institute of Zoology, Zoological Society of London; Yaa Ntiamoa-Baidu, University of Ghana; James Wood, University of Cambridge

Bats play vital roles in maintaining ecosystems but generally are perceived negatively in several cultures. This is heightened by the increasing linkage of bats to zoonotic disease transmission. People's beliefs, perceptions and knowledge are vital in shaping their behaviour towards bats, which subsequently determines their willingness to conserve bats. Using a citizen science approach, we engaged the general public to identify locations of bat colonies and to assess people's perceptions and values placed on fruit bats in Ghana. Colonies belonging to 5 species were identified, utilizing over 2900 tree roosts and 2 caves in 74 different localities across all ecological zones in Ghana. About 90% of these colonies were reported for the first time, including several colonies for the near-threatened Eidolon helvum. Roosts occurred in densely populated areas and in close proximity to humans. There was a general negative perception towards bats and a very low perception of the ecological importance of bats among respondents. Hunting was prevalent at most roosts and about 68% of respondents valued bats as a source of meat or income. Contact with urine and faeces was reported by 34% of respondents whiles the collection and consumption of fruits partly eaten or dropped by foraging fruit bats was common. However, only 24% of respondents perceived risk of disease transmission by bats. These findings provide a better picture of the extent of human bat interactions and highlight the potential persecution faced by bats. Appropriate education about the biology, ecology and importance of bats could be key in bat conservation in Ghana and should focus on how people can coexist with bats without exposing themselves to risks of disease transmission or compromising on the conservation of bats.

CLAYLICKS AS KEY RESOURCES FOR THE STUDY OF TAYASSU PECARI IN THE TAMBOPATA NATIONAL RESERVE PERU

Paloma Alcazar Garcia, Centro de Ornitologia y Biodiversidad; Nancy Carlos Erazo, Centro de Ornitología y Biodiversidad; Clifton Carter, Centro de Ornitología y Biodiversidad

Mineral licks are considered key resources for different species of mammals and birds worldwide, which apparently benefit from their consumption, serving as a mineral supplement, or being a place of convergence that favors social relations between visiting individuals. At the Peruvian Amazon, these mineral aggregations, called "collpas", are used by a wide variety of species, including the White-lipped peccaries (WLP), a keystone species with important ecological roles for neotropical ecosystem structure, vulnerable to human alterations. The aim of the study is to understand the temporospatial patterns of use of mineral claylicks by the white-lipped peccaries (WLP) at the Tambopata National Reserve, as well as characterize and compare the mammal community that may interact or influence peccary behavioral patterns on each scenario. We've selected three large mammal claylicks, at an antropogenic disturbance gradient along Tambopata River, which will be monitored with a set of two camera traps -each one- for a 10-year period, to gain information on seasonality, frequency of use, average time of use, presence of juveniles/newborns, and an overview of general body condition of visiting WLP. The project expects to be a long-term monitoring effort to get information on ecological and health related aspects of WLP at the Southeastern Peruvian Amazon.

CLIMATE CHANGE POTENTIAL EFFECTS ON HUEMUL DEER DISTRIBUTION AND ABUNDANCE IN SOUTHERN SOUTH AMERICA

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Climate change is one of the current major threats for wildlife and the understanding of its effects on distribution and abundance of large mammals is a crucial issue for conservation. Huemul is a South American deer, endemic of southern Andes Mountains, currently remaining ≤ 2000 individuals between Chile and Argentina. To estimate

potential effects of climate change on huemul, we developed two models: a) A MaxEnt distribution model, with 2813 point of presence throughout deer known distribution range and 20 layers of Worldclim database bioclimatic information; we projected model information on data from climate projections of global climate models from two Representative Concentration Pathways (RCP), the best (RCP26) and the worst (RCP85) future scenarios; and b) a population dynamics model, using 12 years of census data from Bernardo O'Higgins National Park, Chilean Patagonia, to build space-state model with El Niño Southern Oscillation (ENSO), Southern Annular Mode (SAM), temperature and precipitation (annual, monthly, and seasonal means) as covariates. The best model was projected 100 years after present. Results indicated that huemul distribution would diminish in 12% on both climate change scenarios. Huemul distribution would contract southward and the best areas would decrease, with dramatic effects in the RCP85 projection. Results on population modeling indicated that an increment of winter temperature would have a negative impact on huemul population growth. Considering all climate change scenarios of RCPs, a declining of estimated population size is expected, but in the worst estimated scenario this reduction could jeopardize huemul with extinction. We expect these results are helpful for huemul conservation and for other species under similar problems, enhancing current management programs for this deer, and developing dynamic protected areas for this type of species affected by climate change.

COMBATTING THE ILLEGAL TRADE IN SEA TURTLE EGGS BY USING GPS TRACKERS PLANTED IN DUMMY EGGS

Kimberly Williams-Guillen, Paso Pacifico; Sarah Otterstrom, Paso Pacifico

Sea turtle species are threatened with extinction; one threat to their survival poaching of their eggs, which are prized in Latin America as a delicacy and aphrodisiac. Poachers may be impoverished locals who earn only a few dollars for dozens of eggs. These eggs make their way to local buyers who consolidate poached eggs and then to middlemen trafficking towards regional and international markets. Documenting such trade routes is a key strategy to disrupting wildlife trade, but the clandestine nature of this market makes tracing them difficult. To meet this challenge, we have developed an artificial sea turtle egg containing a GPS tracker that transmits locations using cellular networks. The 3D printed egg is pliable, water resistant, and closely resembles a real turtle egg. These fake eggs can be planted in nests vulnerable to poaching and then used to follow movements from nesting beach to final market. We plan to deploy eggs at Olive Ridley arribada beaches in Nicaragua and Costa Rica in mid-2017. The information collected will allow us to better understand locations of consolidation points, transit routes, and trafficking patterns in two countries with different laws regarding turtle egg collection. We will detail the egg design, capabilities, and preliminary results of deployment.

COMMUNITY PERCEPTIONS ON FRAILEJON AT HIGH MOUNTAIN LANDSCAPE IN COLOMBIA

Erika Salazar, Pontificia Universidad Javeriana; Amanda Varela, Pontificia Universidad Javeriana

Frailejon is a conservation-reliant complex of species (Espeletia, Espeletiopsis, other genera), for Colombia's strategic paramo ecosystem. It contributes to regulate water cycle and to reduce erosion due to its abundance and altitudinal distribution, among others functions (Hofstede 1997, Mena 2005). However, its conservation is linked to many threats such as climate change, agriculture and mining. As part of an interdisciplinary study carried out on evaluating the factors that contributes to frailejon's health, from 2015 to 2016, fieldwork was carried out for recognizing different perceptions and uses of some frailejon species in the Bogotá region, where 80% of the capital's drinking water comes from. Two basins with higher percentage of transformation (32.5%) of the basin (Siecha's Basin for Chingaza paramo and Teusaca's upper Basin for Cruz Verde paramo) and a lower percentage of transformation, 12.5%, (Calostros Basin for Chingaza paramo and Palo Blanco Basin chosen for Cruz Verde paramo) were selected. Tours and semi-structured interviews with local residents in each area were performed, and reconstructions from community's perceptions were made. There were identified strong differences between basins according to community's lifestyles, traditional believes and relationship with the institutions that operates in their territory. Most people held positive attitudes towards the existence and importance of frailejons and paramo itself, because of their ecosystem services. However, normativity imposed and low institutional trust are the basis to negative perceptions. In addition, medical and other frailejon uses were recognized but most of all from the elders, noticing a very strong disinterest from young people at three of the four basins. At the other basin (Siecha), youth have a relevant attachment to this species due to its spiritual importance. These insights could address conservation challenges developing locally based strategies.

CONSERVATION FOR WELL-BEING: HOW QUALITY OF LIFE PLANS CAN TRANSFORM DEVELOPMENT IN THE TROPICS

Ashwin Ravikumar, The Field Museum; Diana Alvira, The Field Museum; Miguel Macedo, The Field Museum; Alonso Perez, The Field Museum; Paula Tallman, The Field Museum; Alaka Wali, The Field Museum

For at least a decade, quality of life plans have emerged as instruments to engage communities in the management of natural resources in their own lands, and to ensure that local people benefit from conservation. The theoretical foundation for integrated quality of life planning approaches is that indigenous and traditional forest-dwellers have retained and constructed cultural practices drawing on heritage and deep ecological knowledge that are compatible with the sustainable use and conservation of forest environments. These practices, however, are often dismissed or actively suppressed by government agencies and private firms oriented towards extraction and monocrop production, and even at times conservation organizations. Using evidence from action research on quality of life plans carried out by The Field Museum in the Peruvian Amazon over the past years, this paper unpacks the mechanisms by which quality of life plans can transform local development priorities to improve local peoples' well-being through strategies that are consistent with local ways of life, while simultaneously enhancing conservation outcomes. Analyzing data from quality of life plans and initiatives in multiple Amazonian regions, we find that (1) quality of life plans that are based on local social or community assets tend to produce priorities that are more consistent with environmental conservation, and (2) that there is evidence of quality of life planning initiatives elevating the needs of local and indigenous communities politically to increase their likelihood of finding support through government and non-governmental programs. At the same time, most of these initiatives are relatively new, and as they attract increasing attention, rigorous research is urgently needed to evaluate how quality of life plans can best empower local communities, how they can be improved, and how they can most effectively be linked to broader conservation and development processes.

CONSERVATION OF HIGH ALTITUDE MEDITERRANEAN TEMPORARY PONDS IN GREECE

Pinelopi Delipetrou, National and Kapodistrian University of Athens; Ilias Dimitriadis, National and Kapodistrian University of Athens; Kyriacos Georghiou, National and Kapodistrian University of Athens; Katerina Koutsovoulou, National and Kapodistrian University of Athens; Evelina Skoutri, National and Kapodistrian University of Athens; Eirini Vallianatou, J. & A.N. Diomedes Botanical Garden

The conservation of high altitude (1000–2000 m) Mediterranean temporary ponds is one of the objectives of the LIFE11 NAT/GR/1014 project FOROPENFORESTS. Conservation actions were specified after a two-year study of the plant communities and of the geoenvironment, hydrology and geochemistry of 7 ponds on Mt. Oiti and Mt. Kallidromo. Meteorological data collection and plant species monitoring was continued for 3 more years in order to model the effects of climate change. The size, geology, and flooding period of the ponds vary but they are all rain fed and greatly influenced by meteorological conditions. Large interannual fluctuations were observed in the timing and duration of the wet and dry ecophase and in the abundance and spatial distribution of plants. Most of the typical species of the ponds are rare in Greece but inconspicuous and possibly overlooked. Veronica oetaea is a dwarf annual temporary pond specialist endemic to Mt. Oiti. It is Endangered due to its small area of occupancy and high population size fluctuations (> 100 fold). Veronica oetaea population counts and soil seed bank assessment took place for five years. The main threats for all the ponds are grazing and trampling but their impact is significant only at four ponds where plant communities are degraded and subject to weed and alien plant invasion. Scrub encroachment is evident at the surrounding grasslands but does threaten the ponds. Restoration actions include: a) fencing preventing the entrance of vehicles at all the ponds; b) fencing preventing the entrance of animals at part of the degraded ponds, in order to assess the effect of grazing and animal trampling; c) removal of weeds and aliens; d) plant community restoration by reproduction and planting of typical species; d) in situ conservation of Veronica oetaea by pilot introduction at one pond with suitable abiotic conditions; and e) seed bank for the ex situ conservation of Veronica oetaea.

COORDINATING U.S. GOVERNMENT EFFORTS TO COMBAT WILDLIFE CRIME IN NEPAL

Karl Wurster, USAID; Kevin Burke, U.S. Department of Justice; Joseph Evans, U.S. Army; Ari Nathan, U.S. Department of State; Netra Sharma Sapkota, USAID; Karolyn Upham, USAID

In response to the global conservation and security threat posed by wildlife trafficking (including poaching), the U.S. government created the National Combating Wildlife Trafficking Strategy to: (1) strengthen enforcement; (2) reduce demand; and (3) expand international cooperation. In addition, the "Eliminate, Neutralize, and

Disrupt (END) Wildlife Trafficking Act of 2016" calls for a "collaborative, inter-agency" U.S. government approach to Combating Wildlife Trafficking. Beginning in late 2016, U.S. government partners in Nepal (U.S. Agency for International Development, Department of State, Department of Justice, and Department of Defense) initiated a collaborative approach to combat wildlife trafficking in Nepal. Nepal is not considered a major source country of illegal wildlife products, but poaching of high-profile and endangered species still occurs. Additionally, Nepal is a significant transit country for wildlife products moving north into China. The strategy leverages the strengths of different U.S. government programs to help Nepal government and non-government actors improve all aspects related to combating wildlife crime including working with community conservation groups in and around protected areas and important wildlife corridors, to patrol and monitor key habitats and illegal wildlife trade routes, training programs working with prosecutors to more effectively prosecute wildlife crime cases, and law enforcement officers to more effectively collect wildlife crime evidence. The objective of this presentation is to demonstrate how government agencies with different approaches and goals are working together; leveraging the strengths of each organization to strengthen Nepal's ability to combat wildlife crime.

CORAL REEF GRAZERS: EFFECTS OF CLIMATE CHANGE ON EMBRYOS AND LARVAE OF SEA HARES (MOLLUSCA)

Yolanda Chavez, Fundacion Tangare

Marine mollusks are vulnerable organisms that play a crucial role in determining the composition and dynamics of an ecosystem. Intensified anthropogenic pressures, such as ocean acidification and warming, have altered the equilibrium of some ecologically and economically important marine communities. Our knowledge on the isolated effects of these stressors is increasing, however their interactions are poorly understood, particularly during early life stages. This study analyzed the combined effects of ocean acidification and temperature rise on the development of two sea hares, *Aplysia dactylomela* and *Dolabella auricularia*. Individuals were collected at Heron Island on the southern Great Barrier Reef, Australia. In situ experiments were performed to simulate six different scenarios of decreased pH and increased temperature, and to evaluate morphological and behavioral responses of embryos and larvae. We found that embryonic stages were less affected than larval stages, suggesting that the impacts of both stressors may only become evident after long periods of exposure. While results varied between species, the analysis revealed that pH and temperature could interact in several ways, ameliorating or exacerbating their isolated effects. In general, our results indicate that sea hare early life stages can tolerate moderate variations in pH and temperature, but that more severe conditions can produce serious detrimental effects. We suggest that analysis of the combined effects of multiple stressors is crucial in order to properly address climate change impacts, and to identify species stress thresholds along with possible adaptive responses.

CREATING INCLUSIVE SPACES FOR SEA TURTLE CONSERVATION IN NORTHEAST BRAZIL

Marisa Rinkus, Michigan State University

Sea turtle conservation efforts often occur on the beach and near shore areas, making the beach an important space to examine. In many coastal communities in Brazil, the beach is an integral part of day-to-day life from providing sustenance through fishing, jobs from the tourism, and recreation. In addition to the natural oscillations that influence how the beach is used and by whom, the beach is a space that is socially constructed and imbued with power dynamics. Through the use of interviews and participant observation I examine the interplay between the beach as a space for communities and conservation, and the subsequent influence on sea turtle conservation in Northeast Brazil. Findings indicate that conservation activities were sometimes exclusionary, either because of the social and political aspects of the space itself or the transformation of the space and power dynamics by the presence of conservation. Although sea turtle conservation may represent a unique example, these concepts can be applied to other conservation efforts. Considering the impacts of the social construction of space provides insight into the barriers to participation and support for conservation across different groups within a community and opportunities for increasing inclusiveness.

DEAD WOOD AVAILABILITY IN MANAGED SWEDISH FORESTS: POLICY OUTCOMES AND IMPLICATIONS FOR BIODIVERSITY

Bengt Gunnar Jonsson, Mid Sweden University

Dead wood is a critical resource for forest biodiversity and widely used as an indicator for sustainable forest management. Based on data from the Swedish National Forest Inventory we provide baseline information and analyze trends in volume and distribution of dead wood in Swedish managed forests during 15 years. The data are based on ≈30,000 sample plots inventoried during three periods (1994–1998; 2003–2007 and 2008–2012). The forest policy has since 1994 emphasized the need to increase the amount of dead wood in Swedish forests. The

average volume of dead wood in Sweden has increased by 25% (from 6.1 to 7.6 m3ha-1) since the mid-1990s, but patterns differed among regions and tree species. The volume of conifer dead wood (mainly from *Picea abies*) has increased in the southern part of the country, but remained stable or decreased in the northern part. Heterogeneity of dead wood types was low in terms of species, diameter and decay classes, potentially negatively impacting on biodiversity. Overall, we found only minor effects of the current forest policy since most of the increase can be attributed to storm events creating a pulse of hard dead wood. Therefore, the implementation of established policy instruments (e.g., legislation and voluntary certification schemes) need to be revisited. In addition to the retention of dead trees during forestry operations, policy makers should consider calling for more large-scale targeted creation of dead trees and management methods with longer rotation cycles.

DENSITIES AS INDICATORS OF THREAT LEVEL AND CONSERVATION NEEDS OF THREATENED FRUIT BATS ON ISLANDS

Tammy Mildenstein, Cornell College

Over 80% (153/187 spp.) of Old World fruit bats live on islands. Half of these are threatened with extinction due to habitat loss and human disturbance that especially affect island species. Although recognized as species of concern, threatened fruit bats remain largely unknown. Only 1/10 of published research on fruit bats has been on threatened species, compared to the more studied common species. Managers need to know about threatened fruit bat populations to make informed decisions about conservation, but most island populations have not been surveyed. Although population declines are the preferred indicator of threat level, monitoring to detect trends requires more intensive survey efforts than most managers can provide. Fruit bats roost in large aggregations, making it possible to assess population size for a given area. In lieu of long-term monitoring data, I used density estimates from surveyed fruit bat colonies to assess population threat level and to inform conservation management on three island groups. In the Philippines, among 17 roosting populations surveyed, those that experience frequent disturbance are 5 to 10 times smaller for the same amount of habitat as protected colonies. To inform recovery goals for threatened fruit bats in the Mariana Islands, we used the bat density on the most protected island (1.88 bats/ha) to project target population sizes on other islands. Similarly, the fruit bat density measured at a protected roosting area can be used as baseline for comparison in other places. On Mauritius, where fruit bat conflict and management have come under international scrutiny, the fruit bat population density is very high when based on native forest. This suggests agricultural fruit on the island could be driving fruit bat population sizes beyond what is naturally sustainable. Until monitoring programs are developed for threatened fruit bats on islands, density estimates can provide guidance for urgently needed conservation management.

DENSITY-WEIGHTED CONNECTIVITY FOR LANDSCAPE MANAGEMENT AND CONNECTIVITY CONSERVATION

Angela Fuller, Cornell University; Bistra Dilkina, Georgia Tech; Carla Gomes, Cornell University; Dana Morin, Virginia Tech; J. Royle, U.S. Geological Survey; Yexiang Xue, Cornell University

The intended purpose of corridors is to provide regions of the landscape that facilitate movement of individuals. Specific objectives include increasing gene flow, reducing isolation and inbreeding, increasing fitness and survival of species, and allowing species to move and adapt to changes in the landscape. Corridor conservation typically focuses on either 1) conserving areas that support high abundance of species to reduce the risk of demographic stochasticity or 2) conserving areas that allow individuals to move between reserve areas to maintain gene flow. Most corridor design applications focus on patterns of habitat and landscape structure (structural connectivity). However, the impetus of corridor design is the process of animal movement (functional connectivity). Functional connectivity considers the degree to which the landscape facilitates or impedes the movement of organisms and is the product of landscape structure and the response of organisms to this structure. We suggest that maintenance of spatially structured populations requires considerations of both species abundance as well as functional landscape connectivity. We present a model for corridor design in the Chocó-Andean region of Ecuador, home to the endangered Andean bear (*Tremarctos ornatus*) and numerous endemic and threatened birds. We describe a novel metric related to biodiversity conservation and corridor design. The density-weighted connectivity metric is derived from encounter history data commonly collected in capture-recapture studies. Such data allow for simultaneous inference about population density and landscape resistance to movement using spatial capture-recapture models. We demonstrate how density-weighted connectivity models two ecological processes on the outcome of density – movement and resource selection. We highlight how this metric can be used in spatial optimization objective functions applied to landscape management and connectivity conservation decision making.

DIETARY CAROTENOIDS ENHANCE THE CUTANEOUS BACTERIAL COMMUNITIES OF THE SOUTHERN CORROBOREE FROG

Aimee Silla, University of Wollongong; Phillip Byrne, University of Wollonong; Casey Edwards, University of Wollonong; Peter Harlow, Taronga Conservation Society Australia

The rapid spread of infectious disease has resulted in the decline of animal populations globally. Amphibians support a diversity of microbial symbionts on their skin surface that help to inhibit pathogen colonization and reduce disease susceptibility and virulence. These cutaneous microbial communities represent an important component of amphibian immune defense, however very little is known about the environmental factors that influence the cutaneous microbiome. Here, we characterise the cutaneous bacterial communities of a captive colony of the critically endangered Australian southern corroboree frog, Pseudophyrne corroboree, and examine the effect of dietary carotenoid supplementation on bacterial abundance, species richness and community composition. Individuals receiving a carotenoid supplemented diet exhibited significantly higher bacterial abundance and species richness as well as an altered bacterial community composition compared to individuals that did not receive dietary carotenoids. Our findings suggest that dietary carotenoid supplementation enhances the cutaneous bacteria community of the southern corroboree frog and regulates the presence of bacteria species within the cutaneous microbiome. Our study is the second to demonstrate that carotenoid supplementation can improve amphibian cutaneous bacterial community dynamics, drawing attention to the possibility that dietary manipulation may assist with the ex situ management of endangered species and improve resilience to lethal pathogens such as *Batrachochytrium dendrobatidis* (Bd).

DISTRIBUTION AND SURVIVAL OF A RARE MAMMAL THE PACARANA DINOMYS BRANICKII

Carlos Saavedra, Wildlife Conservation Society; Juan David Corrales Escobar, Wildlife Conservation Society; Juan Corrales, Wildlife Conservation Society; Alan Giraldo, Universidad del Valle; Gustavo Kattan, Universidad Javeriana Cali

The pacarana (*Dinomys branickii*) is Vulnerable; it´s threatened by habitat loss and hunting. This is a relatively large body sized Neotropical rodent whose distribution is associated with the Andes and the western Amazonian piedmont. The pacarana is considered a rare species mainly because it is uncommon in the terrestrial mammal diversity sampling; an observation probably linked to its reproductive pattern (long gestation periods, small litter size and long longevity) which is associated with a slow population growth and also to a patchy resource distribution. This research evaluated the factors associated with the species presence through two ecological approaches: distribution and population viability. We analyzed the distribution using Maxent distribution model for its entire extent of occurrence with 180 records and 15 environmental variables. We conducted a population viability analysis (PVA) based on captive population and field data using the program Vortex. We made a survivorship probabilities analysis for hypothetical populations under different hunting scenarios. Topography was the most important factor associated with the species' presence in its potential range. Pacarana's distribution is associated with topographical diversity, steep slopes, high precipitation in the warmest quarter and a narrow range of annual temperature variation. The PVA showed populations are sensitive to changes in reproduction and extraction rates. The persistence of pacarana populations depends mainly on the availability of females. This rare species has life history characteristics that result in low population growth and it does not support the hunting pressure that may occur in throughout its distribution. Factors associated with the distribution of pacarana are abiotic (primarily topography) and biotic related to dispersal ability, and population aspects related to life history characteristics. This permits to confirm that pacarana is a rare species prone to extinction.

DO EDGE AND AREA EFFECTS AFFECT ANT ASSEMBLAGES IN MANGROVES SUBJECTED OR NOT TO ANTHROPIZATION?

Pavel Dodonov, State University of Santa Cruz; Bianca Brito-Silva, State University of Santa Cruz; Jacques Delabie, State University of Santa Cruz

Habitat loss and fragmentation of mangroves has resulted in an increase in the extent of edges, which may affect the invertebrate species living in these coastal environments. We aimed to answer the following questions: Do edges of different types affect the richness and guild frequency of ants? Do vegetation attributes (tree richness and height) and/or fragment attributes (size and conservation) affect ant richness and the occurrence of different species and functional groups? Are the ants more strongly affected by fragment or vegetation attributes? Does anthropization affect the cooccurrence patterns of ant species in mangrove areas? We performed this study in ten mangrove fragments of varying size and conservation status. We placed 12 honey and sardine baits per fragment, at different distances from the edge, and used generalized additive mixed models and

randomization tests to analyze the data. Ant richness and species and guild frequencies were not affected by either distance to edge, vegetation characteristics or fragment characteristics. However, the ants showed a species aggregation pattern. This study shows that the restrictive conditions of mangrove areas are important for structuring ant communities in these areas, possibly with stronger effects than anthropization.

DYNAMIC MANAGEMENT TOOL TO REDUCE BYCATCH OF CRITICALLY ENDANGERED PACIFIC LEATHERBACK TURTLES

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The Eastern Pacific leatherback turtle has declined over 97% since the 1980s and is listed as critically endangered at risk of regional extinction. They historically nested in Mexico and Costa Rica, and the loss from fisheries bycatch and egg poaching is the major reason for their decline. As a highly migratory species, management of leatherbacks requires an understanding of their year-round distribution to reduce fisheries bycatch both nearshore and offshore. In this study, we combined satellite telemetry data and fisheries observations of leatherback turtles to develop a habitat-based model of their distribution. In order to account for the spatiotemporally auto-correlated, unbalanced and presence-only telemetry observations of leatherbacks, a novel modeling approach was applied in this analysis. We used a Poisson generalized linear model in a continuous-time Markov chain (CTMC) model framework for the telemetry data to predict individual, post-nesting leatherback movement throughout the South Pacific based on environmental drivers, such as sea surface temperature. Population-level estimates of leatherback movement were obtained with a Bayesian approach. Fisheries observations were incorporated using a point process model to estimate density under varying environmental conditions for these predominantly juvenile leatherbacks. Monthly, near-real time predictions of leatherback movement throughout the South Pacific are then estimated with these parameters and the most recent satellite-derived environmental information. This tool will help to inform managers, fishers and other stakeholders how to anticipate and prevent fisheries interactions, which is vital for ensuring the viability of this leatherback turtle population.

EDNA AS A WAY FORWARD TO IMPROVE DETECTION OF SOIL INVERTEBRATES: THE CASE OF DUNG BEETLES

Camila Leandro, UPVM3 - CEFE

DNA barcoding and the study of environmental DNA (eDNA) are new monitoring technologies that open new ways in Ecology. These methods are very useful for non-invasive surveys and have the advantage that they can bring light species with low detection rates and/or cryptic such as most soil invertebrates. Dung beetles, which pass the great part of their lives below-ground, are difficult to detect and to identify. Nowadays, this group is declining, threatening the maintenance of soil functions and ecosystem services that they provide. However, the lack of systematic studies focused on dung beetle limits their conservation. Recent non-invasive monitoring technologies such as DNA barcoding and eDNA surveys, appear as a great opportunity to democratize dung beetle studies, and more largely soil invertebrates. However, these methodologies have to be adapted for such organisms. We created a new device to collect species' leftovers (faeces, bristles…) as species' DNA footprints. This device was tested in the laboratory and in the field. The collected DNA, once amplified, allowed us to detect species presence even with a single beetle in the device but also gave us information about their relative abundance without killing individuals. This is a cost-benefit and ethical way to improve and increase dung beetle studies for ecology and conservation goals worldwide. It opens the way to conceive new monitoring devices for other soil invertebrates. Key words: eDNA, dung beetle, monitoring, conservation

EFFECTIVE SURROGATES FOR GENETIC VARIATION IN CONSERVATION PLANNING

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To protect species for the long term, nature reserves and other protected areas need to represent the intra-specific genetic variation found within each species. By conserving the adaptive and neutral patterns of genetic variation found across the species' distribution, protected areas can foster adaptive processes and secure the genetic lineages that make up a species. However, genetic data are expensive and time consuming to obtain. Here we show that environmental and geographic distance

variables are effective surrogates for capturing intra-specific genetic variation in conservation planning. We obtained occurrence and genetic data from the IntraBioDiv project for 27 alpine plant species collected over the European Alps using a gridded sampling scheme. For each species, we identified loci that were potentially under selection using outlier loci methods, and mapped their main gradients of adaptive and neutral genetic variation across the grid cells. We then used the cells as planning units to generate spatial prioritisations. By randomly prioritisations for each species, we verified that prioritisations that captured a larger proportion of environmental variation and geographic spread also tended to capture more intra-specific adaptive and neutral genetic variation. Furthermore, we investigated whether prioritisations generated using surrogate-based targets in addition to conventional area-based resulted in more effective prioritisations. We discovered that prioritisations generated using just area-based targets generally captured a large proportion (> 80 %) of the intra-specific adaptive genetic variation detected in each species. Whereas, prioritisations generated using amount-based targets alone failed to secure most species' intra-specific neutral genetic variation, and were improved with additional of surrogate-based targets. These surrogates were based on freely available data, and could be applied to any study region across the world.

EFFECTS OF HABITAT AREA AND CONFIGURATION ON MAMMALS IN FRAGMENTED LANDSCAPES OF THE ARGENTINE CHACO

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Habitat loss and fragmentation are the main drivers of biodiversity loss. Forest area in the central sub-humid Chaco of Argentina has decreased by 70% due to agricultural land conversion resulting in high levels of forest fragmentation. The effects of this forest lost upon populations of large and meso-mammals, some of them endangered, is unknown. Consequently, we assessed the effect of forest area and configuration on the occurrence and community composition of large and meso-mammals in response to forest area and fragmentation in an agricultural landscape in the central sub-humid Chaco of Argentina. We sampled the terrestrial mammal community at 17 sites (2000 ha) along a gradient of forest area and fragmentation. Using multi-species occupancy models in a Bayesian framework, we accounted for imperfect detection in estimating the relationships among landscape factors and species occurrence and community. We detected 15 mammal species, with estimated site richness from 2 to 10 species. Species occurrence probability ranged from 0.2 – 0.8 and detectability from 0.1 to 0.5. Richness and occurrence of giant anteater (*Myrmecophaga tridactyla*) and Brazilian rabbit (*Silvilagus brasiliensis*) demonstrated a significant increase with increasing forest area. The response to landscape configuration differed among species, possibly related to the differences in habitat use. In general, the mammalian community is dominated by medium-sized omnivores and insectivorous species which may indicate defaunation. Our results indicated that mammalian species richness and occurrence can be affected by habitat area as well landscape configuration, emphasizing the importance of maintaining forest remnants and creating private conservation areas in this hyper-fragmented landscape when developing management and conservation strategies.

EFFECTS OF HUMAN DISTURBANCE ON OCCURRENCE PATTERNS AND BEHAVIOR OF UNGULATES IN EASTERN ECUADOR

Julia Salvador, Wildlife Conservation Society

Yasuní National Park (YNP) is one of the most biodiverse areas in the world and a refuge for wildlife conservation. It is threatened by oil-related activities, road development, and hunting pressure on preferred game species. The Maxus Road (MR) in YNP has caused the intensification of hunting pressure on terrestrial mammals, such as ungulates. The road provides greater access to hunters to unexploited wildlife and to bushmeat markets. The objective of this study was to evaluate the impact that hunting, facilitated by roads, has on the distribution, abundance, and behavior of these species. We use presence-absence data and time-of detection data from a four-year camera trap survey to evaluate whether hunting alters the occurrence and activity patterns of ungulates with respect to distance from MR and Waorani settlements. Occurrence patterns of white-lipped and collared peccary, red brocket and brown brocket deer, and lowland tapir revealed species-specific different responses to higher hunter accessibility. Such differences were related to hunting practices of the Waorani and to ecological differences among species. White-lipped peccary and lowland tapir appeared to be the most sensitive to hunting, showing low capture rates and low probability of occurrence along road area. Hunting also seemed to alter the behavior of white-lipped peccary and

red brocket deer, seen by decreased morning activity and increased nocturnal activity, respectively. These behavioral responses presumably allow avoiding encounters with hunters. Hunting facilitated by MR can influence spatial patterns, community assemblage, and behavior of terrestrial mammals. Responses to hunting vary widely among target species and further studies are needed in the Neotropic to understand species-specific behaviors and their consequences at population level. Knowing the synergistic effects of roads and hunting on the different species of animals will facilitate the creation of strategies for the management and conservation of the local wildlife.

EVALUATING EFFECTIVENESS OF FORESTED NATURA 2000 SITES IN SWEDEN USING HABITAT SUITABILITY MODELS

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Maintenance of forest biodiversity is capitalized in sustainable forest management and accordingly also highlighted in securing functional Green Infrastructure (GI). In this perspective, the forests in Sweden in the European Natura 2000 network (N2k) are expected to provide a backbone for the GI, particularly since most of N2k objects are dominated by forests. One measure of the effectiveness of GI is its role in securing habitat networks. The functionality of habitat networks is an essential precondition for assuring long-term survival of species and hence for biodiversity. In this study, we evaluated the extent to which forested N2k sites provide habitat for specialized species. We tested the ecological functionality of the N2k forest habitats in Sweden using habitat suitability index models (HSI) developed for the bird species: lesser spotted woodpecker (LSW), hazel grouse (HG) and Siberian jay (SJ). The relative amount of habitat was assessed for the species at the stand level and at the landscape level, respectively, where we on the latter level consider species-relevant habitat characteristics in the neighborhood of suitable habitats. The forest data was provided by the SLU Forest Map (k-Nearest Neighbor estimates of stand age and stand volume for major tree species). Applying species-specific buffers to the N2k sites increased the area of effective habitat by 2% (LSW) to 25% (SJ) within the sites. This highlights the importance of an appropriate management of the immediate surroundings of N2k sites for ensuring their functionality as habitat. The largest proportion of all suitable habitat contained by N2k sites was for LSW (50%), and smaller for HG (9%) and SJ (12%). We argue that the HSI model is a versatile tool for evaluating functionality of protected areas for effective biodiversity conservation.

EVOLUTION OF SPECIES' EXTINCTION RISK FOR THE BIRDS OF COLOMBIA 2002 - 2016

Luis Miguel Renjifo, Pontificia Universidad Javeriana; Angela María Amaya-Villarreal, Pontificia Universidad Javeriana

Periodic assessments of extinction risk are important to monitor improvement or failure on species´ conservation action. We analyzed the evolution in the risk of extinction for the largest avifauna in the world between 2002 and 2016. A total of 112 and 140 species were threatened respectively. Of those threatened in 2002, 48% remained in the same category, 14% were uplisted, 33% were downlisted, and 5% changed in taxonomic status. These changes show a rather positive trend. However, there are 37 species new to the list comprising 8 new for science (now threatened), 8 taxonomic splits, and 21 that were uplisted from low concern or near threatened to threatened. The proportion of species threatened due to rapid population decline (IUCN´s Criterion A) has fall, while the proportion of species threatened by having a small, fragmented and declining distribution (Criterion B) is stable, and the proportion of threatened by having a small and declining population (Criterion C) has increased. From all species resident in the country, either seasonally or permanently, one is extinct (endemic), and 7.9% are threatened (12% CR, 40% EN, 48 VU). Agriculture, livestock farming, hunting and illegal trade are the most significant direct threats affecting 55%, 44%, and 31% of threatened species respectively. Natural system modification, logging, energy production and mining were also important, followed by invasive species, roads, commercial and residential development, pollution, climatic events, and human intrusion and disturbance. 80% of the species are affected by more than one factor, and 98% suffered habitat loss. Our results show that although some species have responded favorably to conservation action, these actions have not prevented that others have declined to the point of becoming endangered. This suggests a more comprehensive approach involving prevention of status decline even for those species that do not qualify as threatened.

EXPLORING THE ROLE OF MARINE PROTECTED AREAS IN PROVIDING RESILIENCE TO BIOLOGICAL INVASIONS

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Biological invasions are amongst the major components of current global change and drivers of native biodiversity loss. Globally, there is a lack of knowledge about the impacts of biological invasions when the predominant local stressor 'fishing' is absent. At the same time, there is scarce evidence on the effect of marine protected areas (MPAs) on invasive species. To investigate these topics (which can be seen as the two sides of the same coin) we conducted a broad-scale survey at nine MPAs and adjacent unprotected areas across the Mediterranean Sea, the world's most invaded sea. We surveyed fish assemblages and benthic communities in rocky habitats at 6-10 m depth, at multiple replicate stations (53 in total). All stations within MPAs were fully protected areas where no fishing is allowed, whereas all unprotected areas can be considered open-access. Multivariate statistics were applied to investigate relationships among MPAs and invasive species. We found that invasive herbivores, fishes and invertebrates, were responsible for the creation of extensive barrens in the MPAs in the Eastern Mediterranean Sea. Moreover, the biomass of invasive herbivore fishes was negatively correlated to native herbivores ($R2= 0.59$, $p<0.05$), implying native species displacement due to the presence and increase of invasive competitors. Where invasive species were present and the effect of protection was significant (Lampedusa MPA, pseudo-$t= 5.7691$, $P= 0.0012$; and Zakynthos MPA, pseudo-$t= 2.1936$, $P= 0.0161$), the biomass of invasive fishes was found to be significantly greater in MPAs than in unprotected areas. In conclusion, our results indicate that MPAs do not provide resilience to biological invasions. Yet, the effectiveness of the MPAs in the Eastern Mediterranean, where invasive fishes are present, is poor and this may mask the potential true role of effective MPAs in controlling biological invasions. Further research is needed before generalizing our conclusions.

FEATURES OF ILLEGAL LOGGING IN THE FOREST OF TAIWAN

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Illegal forestry activities of logging precious woods and collecting forest products for artifact and medical purposes generate extraordinarily large profits. To examine illegal loggers' background, motivation, roles and perceptions, we interviewed 69 inmates imprisoned under the Forestry Act, in Taiwan. The characteristics of the forest offenders and the exploited natural resources were further investigated. It reveals that illegal loggers and collectors are largely local inhabitants and over-represented by Aboriginal people. Easy access to forest and traditionally utilizing natural resources seem to be the main reasons for the overrepresentation. Local offenders tend to claim ownership for the forest assets. Acquiring quick cash income is the core objective driving their illicit activities of logging and collecting. Drug addiction and loyalty to gang and family also account the motivation. Employing foreign runaway workers who know little about the organization's operation have become a trend. Depending on localities, loggers and collectors remove various types of forest commodities, including burl wood, dead trees, standing live trees, driftwood, fruiting bodies and mycelia of fungi. Certain tree and fungus species, for example Taiwan yellow cypress, Taiwan red cypress, stout camphor and stout camphor fungus, are particularly preferred. It is important to understand and address the underlying causes of illegal forestry activities. We suggest that the socio-economic benefit, ecological traditional skills and knowledge of local residents should be carefully considered and appreciated while implementing forest protection policies. Participation of adjacent communities to co-manage the renewable forest resources with the authorities would help to reduce illegal exploitation and promote sustainable use of natural assets.

FILLING KNOWLEDGE GAPS ON MANGROVE BIODIVERSITY USING A NOVEL FIELD DESIGN THAT TACKLES THE TIDES

Stefanie Rog, Monash University

Mangrove forests are experiencing rapid decline due to pressures like shrimp farming, coastal development and sea level rise. Emerging threats, such as the unexplained dieback of thousands of hectares of mangroves in Australia in 2016 also pose new risks. These forests are disappearing faster than coral reefs and rainforests, yet we know little about their terrestrial biodiversity. Challenging survey conditions related to tidal influences mean that novel approaches are needed. A global review on the importance of mangroves for terrestrial vertebrates highlighted severe knowledge gaps regarding what species occur in these forests, their ecology and the importance of mangroves for these species and those in adjacent habitats – some of which reported to use mangroves as refuges when their primary habitat is under threat. It is therefore critical to the effective management and conservation of mangrove ecosystems that we fill these knowledge gaps. Here we outline a novel field survey design to rapidly assess the richness of mammals, reptiles and amphibians that utilize mangroves. We combine recently developed and conventional techniques to address the challenges associated with daily inundation of these habitats. We evaluated this design across temperate to tropical latitudes of Australia, making it the most comprehensive survey

of terrestrial vertebrates in mangroves in the world. It highlighted that a significantly greater richness of animal species than previously known is found through field studies. Included in our findings are dozens of terrestrial vertebrates never before recorded in Australian mangroves including a range of threatened and invasive species, providing exciting new insights for the ecology and management of these understudied ecosystems. This novel approach can be used as a tool for scientists and managers across the world to fill critical gaps in our understanding of mangroves forests to facilitate effective management and conservation.

FOOD WEB DYNAMICS ON BRANCHING RIVER NETWORKS

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River food webs inhabitant watersheds with branching geometries. Recent work has suggested strong effects of branching geometries on processes such as population persistence, genetic structure, and patterns of species diversity. In addition, mechanisms influencing dynamics and diversity may operate differently in separate areas of the network. Most work that explicitly considers branching network structure has focused on within taxa or trophic-level dynamics. In contrast, food webs in rivers are known to be influenced by processes that may interact with network structure and position. Using spatially-explicit predator-prey models, we explore how dynamics of trophically interacting species are influenced by the branching nature of river networks. Our models are capable of producing a wide array of dynamics, including stability, fluctuations, and extinctions. In cases where the predator-prey interaction is prone to cycles and local extinctions, the influence of network structure and dispersal can increase regional persistence and community stability. These effects become especially apparent when compared to habits with more regular spatial structure. The main mechanism leading to regional stability is asynchrony in the dynamics among local habitats; when asynchronous local fluctuations are averaged across the river network, predatory-prey dynamics and persistence because less variable at larger spatial scales. This effect is greater in larger networks and at intermediate dispersal rates. In many instances, local habitats may synchronize to generate clusters of linked habitats. In branching networks, the pattern that typically arises is for headwater branches to vary independently of other patches and show high variability, while downstream mainstem habitats show greater clustering and less variability. Overall, these patterns suggest than headwater versus mainstem locations in river networks may show differential responses to management and restoration efforts.

FOREST COVER THRESHOLDS OF AFRICAN ANT-FOLLOWING BIRDS IN AGROFORESTRY AND OIL PALM SYSTEMS

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Ant-following birds are known to be very vulnerable to forest loss and disturbance. However, habitat thresholds for these insectivorous species regarding forest cover have never been estimated. We assessed forest cover and recorded ant-following birds (1,016 records) through 10-minute point counts at 48 one-km2 sites, across an area of 4,000 km2 in Southwest Cameroon that contained a national park, adjacent agroforestry areas, and industrial oil palm plantations. Twenty-one bird species known for their ant-following habits (including occasional swarm attendants) were detected and classified according to diet (true insectivores, insectivores-frugivores, carnivores), foraging stratum and nesting site. We applied Multiple Additive Regression Splines to test the response of relative abundance and species richness of ant-followers to forest cover changes. Species richness declined from an average of 15spp. in fully forested sites to 10spp. or less in sites with less than 74% of forest cover. There was a steady rate of species loss from around 1spp. per 7.8% of forest cover lost. At 65% of forest cover, encounter rates were reduced to less than 50% compared to fully forested sites (from around 40 to 20 individuals per site). In sites with no forest at all, inside oil palm plantations, encounter rates were limited to only two birds per km2 and the detection of only one species. The most sensitive species were *Criniger chloronotus, Dicrurus atripennis, Lophoceros camurus* and *Neocossyphus poensis*, which were absent in areas with less than 52% of forest cover. Species foraging and nesting in the understory remained undetected below 25% of forest cover. Our study confirms the sensitivity of African ant-followers to forest loss from industrial plantations. To avoid loss of these forest specialists, wildlife-friendly agricultural practices would require substantial proportions of forest cover, probably above 80%, such as those shared in traditional agroforestry methods.

FRIENDS AND FAMILY: SOFTWARE FOR IDENTIFYING UNRELATED INDIVIDUALS FROM MOLECULAR MARKER DATA

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The identification of related and unrelated individuals from molecular marker data is often difficult, particularly when no pedigree information is available and the data set is large. High levels of relatedness or inbreeding can influence genotype frequencies and thus genetic marker evaluation, as well as the accurate inference of hidden genetic structure. Identification of related and unrelated individuals is also important in breeding programmes, to inform decisions about breeding pairs and translocations. We present Friends and Family, a Windows executable program with a graphical user interface that identifies unrelated individuals from a pairwise relatedness matrix or table generated in programs such as COANCESTRY and GenAlEx. Friends and Family outputs a list of samples that are all unrelated to each other, based on a user-defined relatedness cut-off value. This unrelated data set can be used in downstream analyses, such as marker evaluation or inference of genetic structure. These results can be compared to that of the full data set to determine the effect related individuals have on the analyses. We demonstrate one of the applications of the program: how the removal of related individuals altered the Hardy-Weinberg equilibrium test outcome for microsatellite markers in an empirical data set. Friends and Family can be obtained from https://github.com/DeondeJager/Friends-and-Family.

GENTAMICIN INHIBITS BACTERIAL CONTAMINATION DURING CHILLED SPERM STORAGE IN THE BOOROOLONG FROG

Leesa Keogh, University of Wollongong; Phillip Byrne, University of Wollongong; Aimee Silla, University of Wollongong

Antibiotics can inhibit bacterial contamination and extend sperm longevity during storage; a primary goal of captive facilities conducting biobanking and artificial fertilisation. This study evaluated the effects of gentamicin on the short-term storage of Booroolong frog sperm. Sperm suspensions were obtained via either testis maceration or, following hormonal induction of sperm-release, as spermic urine. The effect of 0, 1, 2, 3 or 4 mg mL-1 gentamicin on bacterial abundance (CFU mL-1) was determined and sperm motility assessed. In both testis macerate samples and spermic urine samples, gentamicin administered at intermediate-to-high doses (2, 3 & 4 mg mL-1) eliminated, or significantly reduced, bacterial abundance. Sperm samples obtained via testis maceration exhibited significantly different sperm motilities among treatments, with the lowest sperm motility observed at the highest doses (3 & 4 mg mL-1). All remaining treatments (0, 1 & 2 mg mL-1) were statistically similar and maintained sperm motility >55%. Sperm samples obtained as spermic urine exhibited no difference in sperm motility or velocity when treated with any dose. While antibiotic treatment did not improve sperm longevity as predicted, this is the first study to demonstrate that antibiotic treatment can reduce bacterial abundance without compromising sperm motility in an anuran. Antibiotic supplementation may be an important tool for reducing pathogen transmission where sperm samples are transferred between captive institutions for biobanking and AF.

HABITAT OCCUPANCY OF A CRITICAL WEIGHT RANGE MAMMAL IN AN AGRICULTURAL LANDSCAPE

Riana Gardiner, University of Tasmania

Over the last 200 years, Australia has experienced the highest number of mammal extinction globally due to habitat loss, introduced predators and changes in fire regimes. The species most at risk are ground dwelling mammals within the critical weight range: 35g-5500g. Understanding where these species are persisting in modified habitats is essential for efficient conservation measures. The island state of Tasmania, still considered a haven for critical weight range mammals, now faces threats from habitat fragmentation and feral cats, most prominently in the Midlands' agricultural landscape. The Tasmanian bettong (*Bettongia gaimardi*), extinct in the wild on mainland Australia, is directly threatened. We aim to provide macro and micro habitat requirements to inform future restoration efforts. We conducted a landscape scale camera survey in the Midlands bioregion to determine what influences the presence Tasmanian bettongs. We deployed 120 cameras in different habitat types across the Midlands during the austral winter and summer. Vegetation and landscape variables were recorded at each camera site and used as explanatory variables to model occupancy of bettong distribution. Our results suggest that woodland habitat and patch size were the strongest driving factors for the presence of the Tasmanian bettongs, pressing the need to conserve larger sized patches of dry sclerophyll forest. We will also investigate whether the presence of bettongs is influenced by the presence of feral and native predators, and introduced small mammals. Future works will investigate Tasmanian bettong movement decisions within fragments using GPS telemetry to provide more fine scale data to

better inform landholders and industry partners managing the landscape.

HOW CAN WORLD HERITAGE COMMITMENTS SUPPORT SPECIES CONSERVATION?

Wendy Jackson, New Zealand Department of Conservation

Since entry into force in 1975, over 200 natural sites and 35 natural and cultural ("mixed") sites have been inscribed under the World Heritage Convention, which provides collective protection of the world's cultural and natural heritage. Of these, 129 natural sites and 18 mixed sites were inscribed wholly or in part based on a criterion for sites that "contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation." Inscription based on this criterion commits the country to protect and conserve those sites and species, including through a management plan or system that specifies how the outstanding universal values will be preserved. This session will examine the results of a survey of natural and mixed sites inscribed based on this criterion. The results indicate that several mechanisms exist in the World Heritage Convention system to help support species conservation, such as: provision for habitats and species in nomination criteria; explicit guidance to include species in periodic and other types of reporting; promotion of transboundary sites where ranges cross borders; provision of technical assistance in site management; and various capacity building and assistance opportunities. However, these mechanisms need to be strengthened, and there are other means by which the World Heritage system could better support species conservation. Examples that will be discussed include: ensuring the outstanding universal values associated with species are explicitly and consistently included in any decisions that emerge from reporting; and collaboration with instruments that protect habitats (e.g., Ramsar Convention on Wetlands) and that address threats to species, such as invasive species initiatives or the Convention on International Trade in Endangered Species (CITES).

HOW IMMUNE GENETICS CAN INFORM MANAGEMENT OF EUROPEAN GRAYLING (THYMALLUS THYMALLUS)

Jana Huml, Manchester Metropolitan University; Jonathan Ellis, Plymouth University; Ed Harris, Manchester Metropolitan University; Robin Sen, Manchester Metropolitan University; Martin Taylor, University of East Anglia

Global scale ecosystem alteration and current rates of species extinction make the maintenance of biodiversity a major challenge. Genetic diversity is a key parameter for the ability of a species to persist and to adapt to environmental change. This presentation will highlight how genetic research can help to inform decisions for management of a salmonid freshwater species (*Thymallus thymallus*) in the UK, which is primarily managed through supplementing wild populations with hatchery-reared fish ('stocking'). This study is the first to characterize functional genetic variation at immune genes within the Major Histocompatibility complex (MHC) in grayling and to assess the effect of stocking on immune genetic variation. The advantage of directly targeting functional genes is shown, in comparison to 'neutral' markers, which continue to be the method of choice in population genetic surveys that aim to inform species conservation. There was no correlation between MHC and neutral markers for any standard measure of genetic diversity, highlighting that management decisions based on the latter are insufficiently informed. Significantly lower levels of population differentiation at the MHC than in neutral markers was found in purely native but not in 'stocked' populations. This indicates balancing selection acting on maintaining immune genetic diversity in native populations, but that this is impaired in stocked populations. Additionally, significantly lower levels of genetic diversity were found in both 'introduced' and 'native stocked' populations in comparison to native populations for MHC markers, but not for neutral markers. This study adds to the increasing demand of including ecologically meaningful genetic markers for the information and assessment of management decisions and raises further doubt on the efficiency of stocking as a management strategy in supporting long-term viable populations.

HURRICANE MATTHEW PROJECT: DOCUMENTING THE COASTAL ECOSYSTEM COSTS OF HURRICANES ON NEW PROVIDENCE

Kathleen Sealey, University of Miami; Nikita Sheil-Rolle, Young Marine Explorers

The Hurricane Matthew Project (HMP) was initiated to document the damage to coastal resources from the historical Category 4 hurricane that impacted four major islands in The Bahamas. A team of scientists and students started with an assessment of the damage done by Hurricane Matthew on the most populous island of New Providence. Coastal neighborhoods and citizen scientists participated to develop a rapid impact assessment protocol to document damage to the coastal environment, looking specifically at developed and protected coastal

environments (including two national parks). The assessment evaluated building damage, vegetation damage, flooding, solid waste as well as coastal erosion to produce GIS maps to visualize the severity of damage. The HMP has evaluated the cost of coastal erosion as well as degradation of coastal water quality and decline of biological diversity to identify high priority areas for coastal restoration. The role of coastal protected areas in preventing and minimizing damage to nearby human communities was considered. The final outcome was a community-based rapid ecological assessment protocol. The severity of this hurricane damage is unprecedented and offers an opportunity to re-develop to mitigate damage from future storms.

IDENTIFYING DEFORESTATION DRIVERS AMIDST POLITICAL AND BEHAVIORAL UNCERTAINTY IN QUEENSLAND

Blake Alexander Simmons, University of Queensland; Brett Bryan, Deakin University; Elizabeth Law, The University of Queensland; Raymundo Marcos-Martinez, CSIRO; Clive McAlpine, The University of Queensland; Kerrie Wilson, The University of Queensland

In the last three decades, Australia has experienced some of the highest rates of deforestation in the world, with the state of Queensland responsible for over half of the country's extensive tree clearing. While historical clearing rates during Queensland's colonization were driven by biophysical constraints, commodity prices, and political incentives, identifying more recent drivers of tree clearing is confounded by the introduction and inconsistency of new deforestation policies during the last 20 years. We hypothesize that this uncertainty in policy evolution results in significant uncertainty in the clearing behaviors of landholders, which may explain unexpected spikes in clearing rates following new regulations (periods referred to as 'panic' clearing). This study uses an econometric model to investigate the role of numerous biophysical, socioeconomic, and political factors in driving recent historical tree clearing at the state- (Queensland) and regional-level (Brigalow Belt South bioregion), and serves as the first investigation into the influence of policy uncertainty on deforestation in Australia. The results of this analysis will provide crucial insights into the dynamic factors driving deforestation across different scales. Today, researchers and policy-makers are struggling to identify the most appropriate instruments to use in order to curtail future deforestation, and the conclusions of this study will provide invaluable knowledge that can guide the development of future deforestation policies and policy instruments.

IDENTIFYING TRADE-OFFS AMONG RECREATIONAL ECOSYSTEM SERVICES IN URBAN GREEN SPACES

Marie Dade, University of Queensland; Greg Brown, California Polytechnic State University; Jonathan Rhodes, The University of Queensland

Public urban green spaces provide important refuges for urban biodiversity. However, these green spaces are also crucial to human wellbeing, as they provide areas to conduct recreational activities; cultural ecosystem services that enhance physical and mental health and social cohesion. As the number of people residing in urban areas continues to rise, demand for a variety of recreational activities will also increase. Therefore, urban green spaces need to be designed so they are capable of providing multiple recreational activities, but also continue to provide vegetation that is suitable habitat for biodiversity. This study aims to identify whether vegetation characteristics affect the demand for multiple recreational activities within urban green spaces, therefore identifying trade-offs between different recreation types, as well as between vegetation that provides habitat for biodiversity. The Brisbane Local Governmental Area in Queensland, Australia, was used as a case study, due to the diversity of its urban green spaces. We used a public participatory GIS approach to collect spatial information on recreational activities, with survey participants selecting areas they have used for recreation, and the type of recreational activity they did, on an online map. This information was then used to develop discrete choice models, which calculated the likelihood of someone visiting a specific urban green space to conduct a particular recreational activity, based on the park's characteristics, including vegetation, size, location and presence of park facilities. The results of this study show which park characteristics influence the type and number of different recreational activities the park is used for. This highlights the key trade-offs among demand for different recreational activities, as well as vegetation that provides habitat for biodiversity in urban green space.

IMPLICATIONS OF DIFFERENT POPULATION MODEL STRUCTURES FOR MANAGEMENT OF THREATENED PLANTS

Helen Regan, University of California Riverside; Kurt Anderson, University of California, Riverside; Clara Bohorquez, University of California Riverside; David Keith, Centre for Ecosystem Science, University of NSW; Tracey Regan, Arthur Rylah Institute for Environmental Research, The Department of the Environment

Population viability analysis (PVA) has been shown to be a reliable tool for ranking management options for

a range of species despite parameter uncertainty. No studies have yet investigated whether this holds true for model uncertainty for long-lived species with complex life histories and for responses to multiple threats. We test whether a range of model structures give similar rankings of management and/or threat scenarios for two long-lived plant species. Two contrasting long-lived species from different plant functional types are studied: an obligate seeding shrub and a facultative resprouting shrub; these are each exposed to altered fire regimes and an additional, species-specific threat. Long-term demographic datasets are used to construct an individual-based model (IBM), a complex stage-based model, and a simple matrix model that subsumes all life stages into 2 or 3 stages. Results show good agreement across models under some scenarios and poor agreement under others, with the simple and complex matrix models comparing more favorably with each other than with the IBM. Results are robust across models when dominant threats are considered but are less so for smaller effects. Robustness also breaks down as the scenarios deviate from baseline conditions, likely the result of a number of factors related to the complexity of the species' life history and how it is represented in a model. While PVA can be an invaluable tool for integrating data and understanding species' responses to threats and management strategies, this is best achieved in the context of decision support for adaptive management alongside multiple lines of evidence and expert critique of model construction and output.

IMPORTANCE OF INTEGRATED MONITORING SYSTEM FOR SUSTAINING BIODIVERSITY CONSERVATION

Joelisoa Ratsirarson, University of Antananarivo

A monitoring study in partnership with local community is implemented at the Bezà Mahafaly Reserve (southern Madagascar) to better understand the vulnerability and resilience of biodiversity and local communities. Land cover changes show fragmentation of vegetation cover, mainly outside the protected Reserve showing the importance of protected areas for conservation. Rainfall has had an important impact on biodiversity and local livelihoods. Thus, years of good rain are associated with available vital resources for lemurs and thus higher fertility and a higher survival rate of newborn lemurs. Community livelihoods, which are based on agriculture and forests products, are strongly influenced by rainfall variability and its ecological implications. The integrated community-based monitoring system has an important role as an early warning system, and has helped to make relevant decisions for adaptive sustainable management of the Reserve, including protected area extension and promotion of local development. Local partnership at Bezà Mahafaly, with mutual trust between stakeholders is the unique model for sustainable conservation.

IMPROVING THE USE OF CAMERA TRAPS IN ECOLOGY AND CONSERVATION

Cagan Sekercioglu, University of Utah; Mark Chynoweth, University of Utah

Camera traps are a common tool in animal ecology research, helping answer questions on wildlife presence, abundance, trends, and conservation. Because they document elusive species, capture diurnal and nocturnal animals, and collect data in remote field locations without human presence, motion-triggered cameras are an effective, non-invasive biodiversity survey method often used in conservation monitoring. As ongoing technological advances allow cameras to collect continually more photos and video, analysis techniques for large amounts of data are also evolving. However, researchers often use camera traps without defining a specific conservation question or without considering alternate, more appropriate methods. Here, we describe conservation and ecology questions suitable for camera trap studies and their importance for biodiversity monitoring and conservation assessments. By comparing camera traps to other methods, we outline how researchers can match biological questions with appropriate technology. Camera traps are an excellent but underutilized tool for involving citizen scientists in wildlife research, conservation and environmental education. New methods enable millions of citizen scientists already using camera traps to contribute to biodiversity monitoring and wildlife conservation.

INCORPORATING THREATS INTO SPATIAL CONSERVATION PLANNING

Brendan Dillon, University of Queensland; Michael Bode, University of Melbourne; Moreno Di Marco, CSIRO; Hugh Possingham, The University of Queensland; Carlo Rondinini, Univ of Rome La Sapienza

Spatial conservation planning aims to produce protected area (PA) networks that protect biodiversity in the most comprehensive, adequate, representative and efficient way possible. Marxan, a common spatial optimisation program, achieves comprehensiveness and representation by setting targets for the amount of each conservation feature that is to be protected. Marxan then finds the most efficient PA network by selecting the cheapest combination of planning units that meet conservation targets. But to address adequacy, we require information about the processes that underpin population persistence and the way that human threats will affect them in the

future. Recent work has shown that elevated values of the human influence index (HII) within the geographic range of African mammals is a good predictor of their threat status. We used Marxan to create PA networks for African mammals that minimised HII by setting it as either a conservation feature or a cost. We then projected future landscapes assuming different levels of threat abatement within the PA network and two scenarios for the continent-wide increase in HII. The selection frequency of planning units in wilderness areas was higher when HII was incorporated into the Marxan problem and projected landscapes retained more wilderness as a result. However, much of this wilderness was concentrated in the Sahara which supports fewer species than the tropical and savannah biomes. Finally, we predicted the probability that each species will be threatened in the projected landscape by applying an extinction risk model to a database of species distributions and biological traits. Accounting for threatening processes reduced the likelihood that a species would slip into threatened status, especially if HII increase is high. These results demonstrate the importance of considering threatening processes in PA design.

INCREASING SPECIES-SPECIFIC CONSERVATION FOR THREATENED TREES IN THEIR NATURAL HABITAT

Victoria Price, Fauna & Flora International; David Gill, Fauna & Flora International; Georgina Magin, Fauna & Flora International

More than 9,600 of the world's tree species are threatened with extinction. While reversing habitat loss is the primary issue for most of these species, many tree species also require tailored conservation interventions to ensure their long-term survival in situ (including addressing illegal or unsustainable harvesting, removing barriers to natural regeneration or directly reinforcing wild populations through planting). However, tailored in situ conservation action for threatened trees – by protected area staff, NGOs or restoration programmes - is, in many cases, limited or lacking altogether. Often the people responsible for managing or restoring land lack the skills, awareness and resources required to incorporate actions for threatened trees into their work. This talk explores approaches taken by several of FFI's field projects to boost action for threatened trees, as part of the Global Trees Campaign. Case studies describing work to support new and more effective conservation actions from nature reserves in China, restoration programmes in Brazil and government policy in Indonesia are discussed. Opportunities for better support conservation practitioners, through delivery of technical expertise and mentoring, are also explored.

INSPIRING SEA TURTLE STEWARDSHIP IN ST. KITTS WITH VOLUNTARY CERTIFICATION: THE IMPLEMENTATION PHASE

Sara Ramirez, St. Kitts Sea Turtle Monitoring Network; Kimberly Stewart, St. Kitts Sea Turtle Monitoring Network; Eric Wiener, Ramapo College of NJ

The past decade has seen a shift to a tourism-driven economy and an associated boom in development in St. Kitts and Nevis, West Indies, which is threatening the Federation's natural resources, including sea turtles. As a countermeasure, the voluntary certification program, TURTLE APPROVED, was initiated in June 2014 with the aim of educating and encouraging businesses in St. Kitts to adopt sea turtle friendly practices. This interdisciplinary program utilizes ecological and economic strategies to harness the influence of the tourism industry and employ local businesses as the front lines for a national sea turtle stewardship movement. Three categories of CERTIFIED TURTLE APPROVED criteria required for compliance serve to sustainably manage sea turtle-business interaction in beachfront, in-water, or inland conditions. Now in its implementation phase, TURTLE APPROVED is in the progress of aiding pilot businesses in reaching compliance and earning CERTIFIED TURTLE APPROVED status. Here, we will discuss current implementation status, monitoring and evaluation efforts, lessons learned, and future plans for the program. TURTLE APPROVED can serve as a framework for other countries to adapt to their site-specific needs in finding a balance between sea turtle conservation and sustainable tourism. The overarching goal of the TURTLE APPROVED program is to catalyze a national sea turtle stewardship movement in St. Kitts and Nevis, influence policy, and incorporate living sea turtles into the Federation's Cultural Heritage. It is our hope that by using sea turtles as a focal species, TURTLE APPROVED will ultimately influence national perceptions of the Federation's natural resources, improving their valuation, management, and governance.

INTEGRATED ECOSYSTEM ASSESSMENTS IN THE MARINE REALM THE VIDEO PROVES ITS WORTH

Maud Mouchet, MNHN; Dorothee Kopp, Ifremer; Laurène Merillet, Ifremer; Marianne Robert, Ifremer; Michèle Salaün, Ifremer

Marine spatial planning is one way to manage exploited species whilst conserving biodiversity of marine ecosystems. The reliability of such management tool to provide diagnostics and scenarios depends on the availability and quality of biological data on which they are based. To evaluate the effectiveness of management measure, observational techniques could be used to obtain

accurate and precise population data. More and more, classical extractive techniques such as scientific trawl fishing are abandoned in favor of fishery independent techniques such as underwater video. Indeed, the image quality of underwater video has dramatically improved during the last decade and besides recording the community composition, this technique provides information on the immediate habitat or on potential pressures (e.g., trawl marks, presence of waste) and offers a fast implementation allowing to cover large areas. In the present study, we show how monitoring of the biological components of an exploited ecosystem, namely the Grande Vasière area in the French Bay of Biscay, allows to promote an integrated approach to answer fishery or environmental issues. More precisely, we used video data initially acquired for Nephrops stock assessment, to evaluate community richness, species abundances as well as habitat type or environmental and anthropogenic pressures. Underwater video data led to an assessment of community composition in line with precedent studies over the area but also gave access to unprecedented information on fragile species occurrence, which would have been destroyed by an extractive sampling. We show how a holistic approach with an accurate quantification of species and drivers governing ecosystem functions allows for optimal ecosystem management and conservation.

INTEGRATING IN SITU EX SITU AND CIRCA SITUM CONSERVATION OF WILD VANILLA SPECIES IN COLOMBIA

Nicola Flanagan, Pontificia Universidad Javeriana, Cali; Paul Chavarriaga, Centro Internacional de Agricultura Tropical; Ana Teresa Mosquera-Espinosa, Pontificia Universidad Javeriana, Cali

Vanilla is an economically important crop for low-altitude humid tropical regions, offering opportunities for livelihood improvement for forest-dwelling communities. The natural vanilla essence is obtained principally from the fruits of Vanilla planifolia, a member of the Vanilla aromatic clade (*Vanilla subgen. Xanata sect. Xanata*), native to the neo-tropics. Despite its economic importance, vanilla has received relatively little research, yet wild relatives of cultivated vanilla represent valuable genetic resources for both crop improvement, and as a source of new products in a diversified fragrance and aroma market. In Colombia, 22 species of Vanilla have been registered, although there is no tradition of vanilla cultivation in the country. We have identified natural populations of 11 aromatic species. The Chocó Pacific region of Colombia, a biodiversity hotspot, harbors the greatest species diversity, with six species present. Wild populations are subject to severe conservation threats, due to both intrinsic biological traits and extrinsic anthropogenic pressures. Vanilla species are naturally scarce, with populations comprising only a few, or a single individual. Natural pollination events are rare. Small population sizes, and low genetic diversity due to clonal reproduction makes these species extremely vulnerable to population, and eventual species extinction. Further, the lowland tropical forest habitat is undergoing increasing deforestation, having the lowest coverage of protected regions. Ex-situ conservation measures are essential. We have established an ex situ germplasm bank, including in vitro propagation. Together with forest-dwelling communities in the Chocó region we have established propagation actions for conservation in situ through population augmentation, and also sustainable cultivation circa situm of the more promising commercial material.

INTERACTION AMONG FOUR MESOCARNIVORES AN APPROACH FOR MULTISPECIES CONSERVATION

Laura Jaimes Rodriguez, Independent; Valeria Boron, Durrell Institute of Conservation and Ecology

Conserving wildlife beyond protected areas is gradually recognized as being essential for long-term species persistence. Yet, most studies have focused on charismatic or flagship species' (e.g., jaguars) use of these areas. Mesocarnivores have shown tolerance to human activity, however their responses to habitat disturbance is poorly studied and understood. The increasing land conversion in the tropics can change the mesocarnivores interspecific interactions threatening vulnerable and rare species by reducing their abundance or even excluding them from some habitats or areas. This study examines a mesopredator guild (*Puma yagouaroundi, Eira barbara, Cerdocyon thous* and *Procyon cancrivorus*) spatiotemporal interactions in a landscape dominated by palm plantations. We used camera trap data and environmental variables to develop Bayesian framework co-occupancy models to evaluate the spatial interaction among the four sympatric species across an agricultural area in the Magdalena Medio region of Colombia. We also evaluated temporal interactions of these species by examining the activity patterns of each species. We found that a mosaic of plantations, grasslands, wetlands and forest can support the coexistence of even species that are not habitat generalists and which may have significantly overlapping diets, even in areas where top predators (i.e., jaguars/ocelots) were present. Such landscapes therefore are worth considering in national conservation plans. We show that "mosaic" areas could support a rich mesopredator community and that there is value in examining intra-guild interactions as current competition assumptions from

natural habitats may differ in these areas possibly due to more ecological niches available to fill. These findings can bring useful information about their ecology, which can be used to inform future multispecies conservation programs that aim not only at endangered species but also at preserving the overall carnivore assemblage.

JAGUARS AND CAMERA TRAPS: HABITAT USE AND CONNECTIVITY IN THE MAMONÍ VALLEY PRESERVE, PANAMA

Kimberly Craighead, Kaminando

Jaguars are a keystone species, yet considered near threatened by the IUCN (Caso et al., 2008 [IUCN]). Jaguars currently range from Mexico to Argentina, but have been extirpated from more than 50% of their historic range. Mesoamerican jaguars have been extirpated from over 77% of their historic range (Wultsch, et al. 2016). Three major anthropogenic pressures have contributed to their current status (1) habitat loss and fragmentation due to the expansion of the agricultural frontier, (2) the decline of prey species due to illegal poaching, (3) the increasing conflict between jaguars and livestock. Mesoamerica has experienced one of the highest deforestation rates worldwide. The Isthmus of Panama has lost 14.3% of its forest cover between 1990 and 2010, and only 43.7% remains forested (Food and Agriculture Organization of the United Nations 2010). Thus, migration and movement along the Isthmus is difficult for jaguars. The landscape on the east side of Panama has experienced large-scale land use modification with expanding agriculture and deforestation around protected areas; resulting in the increase of isolated habitat patches and consequently, the potential isolation of jaguar populations within this landscape. For wide-ranging carnivores, such as the jaguar, protected areas may not be large enough to support their behavioral needs (i.e., hunting, breeding, dispersing). Thus, determining movement corridors between protected areas is important for the long-term conservation and viability of jaguars in Panama. This project uses camera trap data to investigate the habitat use of jaguars in the Mamoní Valley Preserve, and assess the connectivity of the preserve with adjacent protected areas (Chagres National Park and Guna Yala Indigenous Territory).

LANDSCAPE-LEVEL EFFECTS OF DEFORESTATION ON LARGE AND MESO-MAMMAL OCCURRENCE IN THE PARAGUAYAN CHACO

Jeffrey Thompson, CONACYT - Guyra Paraguay; Rodrigo Ayala, Universidad de Buenos Aires; Evelyn Britez, Guyra Paraguay; Hugo Cabral, Guyra Paraguay; Juan Campos Krauer, Centro Chaqueño para la Conservación e Investigación; Jose Luis Cartes, CONACYT; Viviana Rojas Bonzi, Guyra Paraguay; Marianela Velilla, CONACYT - Guyra Paraguay; Alberto Yanosky, Guyra Paraguay

The Himalayan Region is a global center of biodiversity. The red panda is the least studied endangered species of the Himalayas. Most studies have focused on the distribution, habitat, and diet of this species in eastern and central Nepal. In this study, we explored the variables associated with the presence of red panda in the seven hunting blocks of Dhorpatan Hunting Reserve (DHR), Nepal. We established plots where signs of red panda were encountered "presence plot" and where signs of red pandas were not observed "absence plot". Ground cover was not significantly correlated to the presence of red panda. Crown cover, the presence of poaching signs such as snares and man-made structures for poaching, presence of other wildlife and presence of serow (*Capricornis thar*) were positively correlated to the presence of red panda whereas the presence of fire in its habitat was negatively correlated to the presence of the red panda.

LARVAL ECOLOGY AND DISTRIBUTION OF RED MANGROVE CRAB UCIDES OCCIDENTALIS IN GULF OF GUAYAQUIL

José Pontón Cevallos, Escuela Superior Politecnica del Litoral

The red mangrove crab (*Ucides occidentalis*) is an important artisanal fishery resource in the Guayas River estuary, one of the major hydrological systems of the western coast of South America. Local communities settled on remote areas of the estuary benefit from this fishery through regulated resource extraction from Marine Protected Areas (MPAs). Around two thousand fishermen benefit from this activity selling an estimated of thirty million animals per year, mostly to the nearby market of Guayaquil. Current conservation measures are mostly focused in the estuarine system; nevertheless, human activities taking place in the upper watershed could threat the resource. Intensive agriculture, limited access to sanitation, hydrological regulation, shrimp farming and harbor operations could result on water quality impairment and habitat degradation. Despite the relevant cultural and socio-economical value of this fishery for the region, important aspects of their biology are still understudied (e.g., life cycle, larval dispersal and population dynamics). In this study, a trans-disciplinary approach was taken combining scientific research with community outreach activities in cooperation with fishermen associations in the Guayas River estuary in order to monitor the larvae populations and their habitat characteristics. Currently, two MPAs within the estuary system with different degree

of human alteration are being monitored to determine spatial and temporal patterns of larval habitat use and dispersal. Since life cycle is incomplete on this species, females with eggs are taken to a nearby aquarium, and larvae hatched in laboratory are cultured under controlled water conditions for stage identification. Water quality data and several local unpublished studies are reviewed currently to explore the contribution of basin level activities to the presence and movement of contaminants and their effect in mangrove fisheries sustainability.

LEADERSHIP STRATEGIES AND SPECIES RECOVERY

Brett Bruyere, Colorado State University; Matthew Halladay, Colorado State University

Successful species recovery requires leadership that can successfully influence stakeholders, motivate staff and work at multiple scales of an issue. In this study, we completed a systematic review of more than 35 articles about conservation leadership or successful species-related conservation projects, to identify five leadership domains, each domain defined by two to five actionable strategies. The domains include: stakeholder/partner engagement; building trust; internal communication; vision; and individual champion. We applied this five-point leadership domain to two very different case studies: the African lion (*Panthera leo*) in northern Kenya (conservation efforts led by Ewaso Lions), and the Mountain plover (*Charadrius montanus*) in western Nebraska (U.S; conservation efforts led by Bird Conservancy of the Rockies). In both cases, the respective NGO successfully shifted prevailing public sentiment of stakeholders from antagonism or neutrality toward the animal, to a sentiment that is supportive of and encourages participation in conservation. Given the stark differences between the two cases, we expected each case to have its own unique set of leadership strategies that led to success. However, in both cases, trust building and stakeholder engagement were of paramount importance. In addition, while our systematic review did not detect "navigating uncertain funding" as a leadership strategy, both cases also showed that leaders who can navigate the often-changing world funding and priorities in NGOs. Note to reviewers: a third case study – the Adjustant stork (*Leptoptilos dubius*) of northeastern Kenya (led by Wildlife Conservation Society) is scheduled for study in March/April 2016, but it is currently unclear if we will have results to share at ICCB 2017.

LEGISLATIVE AND POLICY BARRIERS TO ECOLOGICAL RESTORATION OF AN INDIGNEOUS FRESH WATER SITE

Toni Love, Victoria University of Wellington

Kumutoto Stream, a culturally important site for indigenous MŪori, forms part of municipal drainage system in Wellington City and is part of the VUW Wellington Chapter's Kumutoto Forest Restoration Group's restoration project. It's inclusion in the stormwater drainage line means it is subject to pollution and excessive water flows resulting in decreasing water quality and an inability to establish a riparian zone. This project ascertained whether the legislative framework for freshwater and culturally significance sites provides adequate protection that enable better restoration of the stream. Legislative and policy framework for freshwater was examined, including, bio-markers for water quality, such as dissolved oxygen and nitrogen, and its subsequent trend over time at Kumutoto Stream. Results demonstrated that Kumutoto Stream had declined over time, a trend shared with other streams in Wellington City. Freshwater legislation and policy was shown to provide a considerable amount of protection to freshwater, including streams, with a particular emphasis on indigenous sites. However, the national standards set for water quality, as well as the relative strength of the legislation, meant that the protection was largely redundant and legislative policy ineffective because it does not address compliance and enforcement, and its low standards for water quality mean it is only useful in very severe cases. The implications of this study show a disconnect between science and law. The national standards do not reflect ecological standards of water quality required for successful restoration. Dependence on traditional means of protection is currently inadequate and ecological restoration as a result will continue to suffer unless there is further pressure placed on government to create legislation that meets ecological and conservation needs.

LESSONS LEARNED FROM THE FIRST VOLUNTARY PRIVATE LAND CONSERVATION PROGRAM IN URUGUAY

Gonzalo Cortés Capano, University of Helsinki; Verónica Etchebarne Palla, Vida Silvestre Uruguay; Oscar Blumetto, Vida Silvestre Uruguay; Sabrina Cupeiro, Vida Silvestre Uruguay; Verónica Piñeiro Rodríguez, Vida Silvestre Uruguay; Mariana Ríos, Sistema Nacional de Areas Protegidas; Sofia Scanavino, Vida Silvestre Uruguay; Alvaro Soutullo, Centro Universitario Regional Este; Cecilia Suárez, Vida Silvestre Uruguay; Maria Szephegyi, Vida Silvestre Uruguay; Natalia Zaldúa, Vida Silvestre Uruguay

In Uruguay more than 90% of the territory is privately owned and the National System of Protected Areas covers 1% of the territory. In this context, the Non-Governmental Organization Vida Silvestre Uruguay (VSUy) has been promoting voluntary private land conservation (PLC)

through its Wildlife Refuges Program since 2011. This Program is the only voluntary PLC initiative in Uruguay and aims to build a voluntary network that contributes significantly to biodiversity conservation, that promotes sustainable production and that is socially valued at the national level. In this sense, VSUy works collaboratively with landowners to define the conservation objectives, to assess the conservation status, the main threats to biodiversity and to plan for actions implementation and monitoring. Currently, the program consists of ten Refuges covering 3145 ha. The main ecosystems represented are endangered temperate grasslands, different kinds of native forests, shrublands and wetlands. The main land uses are cattle ranching, biodiversity conservation, ecotourism, environmental education, recreation and mineral water extraction business. In 2015 VSUy signed an agreement with a mineral water company to collaborate in the development of media campaigns to advocate the importance of nature conservation to the broad public and to cover the implementation costs of priority conservation actions in the Refuges. In this context, during 2015 six new Refuges joined the Program. During 2016-2017 Refuges landowners were invited to apply for small grants to cover the implementation costs of conservation actions. Eight conservation and sustainable production actions were implemented within the Refuges in the areas of ecosystem management, exotic invasive species control, monitoring, nature based tourism and environmental education. This experience has proved to be relevant both to improve the Refuges conservation status and to motivate landowners to continue engaged in voluntary conservation.

LIVING WITH GIANTS: HUMAN-ELEPHANT CONFLICT IN MYANMAR

Christie Sampson, Clemson University; Peter Leimgruber, Smithsonian Conservation Biology Institute; David Tonkyn, Clemson University

Wild elephant populations in Myanmar have dropped from as many as 10,000 animals in the 1940s to as few as 2,000 today. As elephant habitat is increasingly developed for agriculture and other uses, human-elephant conflict (HEC) rates rise, with detrimental consequences for both species. These activities can lead to the local extinctions of elephant and broad-scale population declines across the range. Current HEC mitigation strategies in Myanmar, such as elephant drives and translocation, are ineffective at reducing or preventing conflict. As a result, communities still suffer high rates of crop loss and threats to personal safety. Increasing animosity in communities towards elephants exacerbated by habitat loss could lead to further dramatic declines in Myanmar's wild elephant population. We are developing a framework to identify areas where management can best reduce HEC, while minimally impacting elephant population health. Our research explores three elements: 1. assessing local communities' conservation attitudes and risk perception towards elephants; 2. using fecal DNA to determine what proportion of the local elephant population engages in conflict activities and identifying common characteristics to focus HEC mitigation strategies; and 3. investigating changes in elephant movement and habitat use during different climatic and agricultural seasons to improve our knowledge of how elephants use the landscape. We are combining the results of these investigations to inform mitigation policies in Myanmar. Pilot studies at our field site have already revealed startling levels of elephant poaching, and shown mitigation methods such as seasonal electric fencing and educational outreach to be successful in the area. The ultimate goal of this research is to provide recommendations to the Myanmar government and local NGOs that can improve elephant conservation policies and better utilize the limited resources available to reduce HEC in Myanmar.

MAMMALS OF LAS PIEDRAS RIVER ECOLOGY AND CONSERVATION IN A CHANGING LANDSCAPE

Caterina Cosmopolis, Universidad Nacional Agraria La Molina

This study focuses on mammal species diversity in the lowland Amazonian rainforest of southern Peru, and on the importance of private protected areas for maintaining mammal's assemblages in this region. Main threats for mammals' diversity in the area are due to growing pressures on their resources from activities such as farming, selective logging, tourism and Brazil nut extraction. Among them, selective logging has the greatest impact on the forest ecosystem. Additionally, recent studies suggest that protected areas might not be adequate to conserve the tropical forests' biological diversity because of their limited size, number, distribution, composition, and protection status (Fimbel et al. 2001). Thus, the conservation of the neotropical rainforest depends on managing the use of resources outside protected areas to compliment the protection of biodiversity. This study aims to compare the abundance of hunted mammals on four different sites along Las Piedras river and assess their recovery rates in an area of productive forest that was selectively logged. The results and conclusions drawn can be used to help manage and protect wildlife in and around selective logging concessions and areas of human habitation. We also present data on the conservation status of the mammals

of Las Piedras according to IUCN and CITES categories.
Key Words: Amazonia; mammals; beta diversity; selective logging; private protected areas

MANGROVES AND FISHING CAT, WHO PROTECTS WHOM? A CASE STUDY IN SOUTH INDIA

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In India, the total area of mangroves is 6740 sq. km, which are mainly distributed along the east coast compared to scattered patches in western coast. These well-known ecosystems play an important role in protecting against coastal erosion and natural calamities such as cyclones and tsunamis. They also provide good refuge to some of the most endangered flora and fauna such as tiger, fishing cat, salt water crocodiles etc. Fishing cat *Prionailurus viverrinus* is an Endangered species but little is known about its habitat and ecology. Unlike other cats, fishing cats are wetland specialists occurring in both coastal wetlands like mangroves and inland wetlands like swamps, lakes etc. Due to a complex root system coupled with porous clayey substratum, mangroves are comparatively less accessible to humans than inland wetlands. And therefore, they provide potentially safer habitats for the fishing cat populations to persist. Camera trapping was carried out in three important blocks of Coringa mangroves to estimate the population of fishing cats with a total of 198 camera trap stations. Results show an abundance of 75.0 ±7.7 (SE) (62.8 – 94.3) individuals, with 107 captures of 54 different individual cats. The density estimate using SECR was 0.53±0.94 (SE)/km2. This study highlighted the importance of healthy mangrove forests in conservation of the threatened cat since the likelihood of occurrence of fishing cat was higher in dense mangrove patches and lower in the human-modified habitats such as, agricultural farms, aquaculture ponds etc. At the same time being the top predator, fishing cats can act as flagship species for enhanced protection of the Godavari mangroves. So, this project which took place in Godavari mangroves of southern India helped in understanding the mutual relationship of mangroves and fishing cats in their conservation, and finally in protecting the local communities' dependent on this ecosystem.

MARINE RESOURCE GOVERNANCE INFLUENCES PROTECTED AREA ESTABLISHMENT IN EASTERN INDONESIA

Phillip Mohebalian, World Wildlife Fund; Ignatia Dyahapsari, World Wildlife Fund; Estradivari Estradivari, World Wildlife Fund; Louise Glew, World Wildlife Fund-U.S.

Marine spatial planning efforts seek to sustain biodiversity and marine livelihoods, by optimizing the placement of marine protected areas (MPA), and other conservation interventions to meet multiple social and ecological objectives. While a growing body of evidence suggests MPA placement is often biased toward ecologically important areas with lower alternative economic value (e.g., remote from markets), the role of other social characteristics, including customary tenure and management systems in influencing MPA design is poorly understood. To examine how pre-existing marine resource governance influences MPA placement, we document marine resource dependence and governance conditions, coincident with MPA establishment, in 198 settlements across Eastern Indonesia, characterizing governance using Ostrom's 8 principles for managing common pool resources. We find substantial differences in marine resource governance between MPA and control settlements. For example, while participation in marine management community groups is similar between MPA and control households, financial contributions by members to those groups, in the year prior to baseline were nearly three times greater in MPA settlements (mean: USD 3.5) relative to similar non-MPA controls (mean: USD 1.5, P=0.041). Our findings suggest MPAs in Eastern Indonesia are preferentially established in communities with strong pre-existing marine tenure and governance systems, with MPAs codifying customary governance systems into national legal frameworks. Consequently, in addition to the bias of MPA placement towards areas at greater distance from urban centers and areas of lower economic value, socio-economic and governance characteristics may also play an important role in determining where MPAs are instituted. Bridging our gap in understanding of these social biases of MPAs can shape how we target and design MPAs, thereby maximizing their social and ecological impacts.

MARINE RESOURCE MANAGEMENT AND SOCIAL-ECOLOGICAL VULNERABILITY TO CLIMATE CHANGE IN THE CARIBBEAN

Katherine Siegel, UC Berkeley; Reniel Cabral, UC Santa Barbara; Sarah Lester, Florida State University; Jennifer McHenry, Florida State University; Elena Ojea, University of Vigo; Brandon Owashi, UC Santa Barbara

Coral reef systems and the human communities that depend on them are at risk of ecological and socioeconomic disruption due to climate change. Ecological and human communities have varying levels of vulnerability to the disturbances associated with climate change, and this mediates climate change's impacts on individual social-ecological systems. We assess the variation

in social-ecological vulnerability to climate change-induced coral bleaching in coastal systems in the insular Caribbean. The Caribbean region is ecologically, socially, and politically diverse, presenting opportunities for analysis of different factors contributing to the three components of vulnerability: exposure, sensitivity, and recovery potential or adaptive capacity. We reveal important variation in the levels of ecological and social exposure, sensitivity, and adaptive capacity across the island nations and territories of the Caribbean. While past studies have focused on either the ecological resilience of Caribbean reefs or the socioeconomic vulnerability of island communities at local scales, we combine spatially-explicit data on coral reef health, reef-based economies, and marine management practices throughout the Caribbean. In addition to analyzing patterns of vulnerability, we also examine how ecological recovery potential and social adaptive capacity are correlated to measures of governance and marine conservation across the island states. Our results are relevant to regional- and island-level efforts to reduce vulnerability and increase adaptive capacity, illuminate key factors contributing to vulnerability, and provide an unprecedented compilation of ecological and socioeconomic indicator data for the Caribbean that will be useful for addressing a range of questions related to climate exposure, ecosystem vulnerability, and social-ecological resilience.

MAURITIA FLEXUOSA FRUIT TRADE IN PERU: DRIVERS FOR EXTRACTION AND CONSERVATION POTENTIAL

Chelsie Romulo, Dept. of Environmental Science and Policy, George Mason University; Francisco Dallmeier, Center for Conservation Education and Sustainability, Smithsonian Insitute; Bryan Endress, Department of Animal & Rangeland Sciences Oregon State University

This research describes the collective management and harvest of *Mauritia flexuosa* fruit in the northeastern Peruvian Amazon within the context of identifying market drivers and potential for conservation interventions. *M. flexuosa* is a long-lived dioecious palm that grows to 30m in height and forms expansive palm swamps covering up to 10% of the Peruvian Amazon. This palm provides critical habitat and food for many wildlife species. The fruit harvest has widespread ecological concerns as the most common method is to cut down female trees, which has resulted in many male-dominated stands. Rural communities throughout the Peruvian Amazon harvest *M. flexuosa* fruit to be sold in the largest city in the region, Iquitos. This species is the target of several conservation and management initiatives and understanding the complex interactions of the market chain are important for designing effective management strategies. Through over 1,000 semi-structured interviews with individuals representing every aspect of the market chain, extraction motivation and distribution patterns are described. Of the 24 communities visited, 10 have participated in climbing workshops, but only two currently harvest by climbing. We estimate that over 90% of the fruit sold in Iquitos is harvested by cutting instead of climbing. Harvest of non-timber forest products (NTFPs) such as *M. fleuxosa* fruit are often promoted as a means of sustainably providing income to rural families in developing nations yet our findings question this assertion. Our results highlight many reasons for not climbing, such as lack of practice or access to materials. Of the 14 communities that have not participated in workshops, five have been offered workshops but either declined or have not received follow-up. This study highlights the need to address market access, flow, and fluctuations as well as harvest method as part of a holistic conservation and management strategy for the species.

MECHANISTIC MODELING OF SOCIAL-ECOLOGICAL SYSTEMS FOR WILDLIFE CONSERVATION

Neil Carter, Boise State University; Andres Baeza-Castro, Arizona State University; Volker Grimm, Helmholtz Centre for Environmental Research; Simon Levin, Princeton University; Nicholas Magliocca, National Socio-Environmental Synthesis Center

Conservation policies often do not have the expected impact largely because humans do not always behave as expected, ecological processes are overlooked, and feedbacks in social-ecological systems (SES) are not taken into account. Mechanistic SES modeling has a high potential to address these challenges. To illustrate the utility of mechanistic SES modeling to wildlife conservation, we present findings from two interrelated agent-based models of human-wildlife interactions. The first model investigates the effects of human disturbance on the globally-endangered tiger (*Panthera tigris*) in Nepal's Chitwan National Park. It has high ecological realism by including empirically-informed rules on resource-based acquisition of tiger territories and interactions between females and males. In contrast, the second model investigates human-wildlife conflict, such as crop raiding and livestock depredation, along a simulated interface of wild and agricultural lands. Human behaviors in the second model are informed by social-psychological and economic theories and affect both human livelihoods (agricultural productivity) and wildlife populations (habitat availability). The first model counterintuitively shows that more extensive, but less intensive human disturbances

(i.e., some reduction of prey densities over a large spatial extent) in a geographically-closed protected area have greater negative effects on tiger populations over time than less extensive, more intensive human disturbances (i.e., complete reduction of prey from small patches). The second model shows that emergent spatiotemporal patterns of human-wildlife conflict relate to the degree to which human perceived risk from wildlife is socially "contagious" within a community. We conclude by elaborating how multi-model approaches foster transferability of gained insights to other contexts and case studies that prevail in the Anthropocene.

MONITORING AND IMPACT EVALUATION ON THE SOUTHERN CHILE

Priscila Molina, WWF Chile; Irina Montenegro, WWF Chile

With the target of ensuring successful strategic planning and management, WWF Chile have been working since 2011 to consolidate tools that allow timely and appropriate measurement on strategic performance and conservation impacts of its defined strategies. Monitoring is therefore a transversal axis to planning and management that provides updated information on how efficient we have been in the use of technical, financial and logistical resources available for the development of prioritized work strategies, and how effective they are in achieving the proposed goals and targets. At the same time, through the results of the monitoring is contributed to the construction of learning and, therefore, it strengthens the decision making under an approach of adaptive management. Several tools have been developed, adapted and tested in order to effectively monitor conservation targets, threats and strategies. At strategic level, a monitoring plan establishes the current status of conservation targets, threats and strategy outcomes per geographic scope. At operational scale, a scorecard tool to monitor efficiency, strategic coherence and operational coordination between areas of work, has been developed and currently under measurement. Finally, during the last two years, WWF Chile has been coordinating two pilot cases on impact evaluation of viability of Commodities Certification Systems, and developing alliances with postgraduate programs of some universities in Chile that allow us to increase scientific rigorousness of its conceptual and methodological framework. Preliminary findings are able to be shared. Findings on each monitoring level will be shared on this presentation.

MULTICRITERIA PRIORITIZATION TO SPATIALLY DEFINE RESEARCH AND MANAGEMENT ACTIONS FOR CARNIVORES

Diego Zárrate-Charry, ProCAT Colombia; OSU; Matthew Betts, Oregon State University; José González-Maya, ProCAT Colombia; Sierra to Sea Costa Rica; Aimme Massey, Oregon State University

Human-wildlife conflict and habitat loss are the main threats for carnivore species worldwide. Forest conversion to agricultural lands increases the proximity between carnivore habitats and local communities, resulting in events of conflict. Knowledge about carnivore species is scarce, particularly in data-poor countries in Latin America. This knowledge gap separate species needs from landscape management decisions. There is an increasing need to develop methodologies that allow identification of research and management areas for carnivore species at the appropriate scales. These methods should include the multiple criteria that shape conservation needs, including habitat requirements, connectivity needs and human-wildlife conflict. Multicriteria approaches allow inclusion of diverse variables that shape species conservation needs. Such approaches must guide environmental institutions to address landscape decisions. We develop a prioritization scheme for carnivores, that identify priority areas based on relationship between three spatial criteria: (1) suitable patches, (2) connectivity areas, and (3) areas with higher likelihood of human-jaguar conflict occurrence. The relationships between these spatial analyses allowed us to identify priority research and management areas where institutional effort should be encouraged. We applied this prioritization scheme using Jaguars (*Panthera onca*) on the Sierra Nevada de Santa Marta, in the northern of Colombia. Using the identified priority research and management areas, we defined actions based on the tenure of the land and its spatial relationship with protected areas. Our analysis indicates that Private land conservation will be extremely important for maintenance of habitat and connectivity for the species and will strongly influence the efficacy of protected areas. It also highlights the location of areas were specific environmental institutions should focus their efforts.

MULTI-SCALE IMPLEMENTATION OF GREEN INFRASTRUCTURE TO MITIGATE BODY SIZE SHIFTS IN URBAN COMMUNITIES

Thomas Merckx, Université catholique de Louvain; Hans Van Dyck, Université catholique de Louvain

Urbanisation poses a worldwide conservation challenge. Not only does it lead to biotic homogenisation, but urban warming may cause eco-evolutionary impacts on body

size, a key trait known to impact life-history traits and ecosystem functioning. Since global climatic warming has forced a reduction in body size for many species, we predicted that the urban heat island effect may similarly affect urban communities. As such, using a highly replicated, nested sampling design covering urbanisation gradients at local and landscape scales within Belgium, we quantified –as a function of urbanisation degree– both the urban heat island effect for grassland, woodland and pond biotopes based on year-round hourly temperature readings, and shifts in community-weighted mean body size values for 11 aquatic and terrestrial taxa. Results of our concerted sampling effort show that urbanisation generally leads to communities of smaller-sized species, in line with the recorded higher temperatures at urban biotopes. However, urban Lepidoptera and Orthoptera communities consisted on average of individuals from larger species than those from rural communities. Nevertheless, this opposite pattern was expected as both taxa display positive size-dispersal links. Cities are not only warmer, but experience also intense habitat fragmentation. This reduced connectivity may be mitigated by larger body sizes when increased size covaries with increased dispersal, hence overruling the general pattern towards smaller-sized communities with increasing urbanisation. Because all analyses were repeated at seven spatial scales (50 m up to 3200 m radii), we managed to pinpoint the precise scales at which surrounding urbanisation has the clearest impact on the various taxa and biotopes. Implementing mitigation measures, such as increasing quantity and/or quality of green urban infrastructure, would be most effective at multiple spatial scales.

NATURAL INFRASTRUCTURE OPTIONS FOR SEA LEVEL RISE ADAPTATION FOR COASTAL CALIFORNIA

Sam Veloz, Point Blue Conservation Science; Bob Battalio, ESA; Tiffany Cheng, ESA; Maya Hayden, Point Blue Conservation Science; Jenna Judge, NOAA Sentinel Site Cooperative; Kelly Leo, The Nature Conservancy; Sarah Newkirk, The Nature Conservancy

Coastal communities in California are extremely vulnerable to future sea level rise with up to 500,000 people and $100 billion dollars in assets at risk from flooding. Coastal ecosystems, which already suffer from the impacts of human development and other landscape modifications, are also threatened by rising seas. The default adaptation options most coastal decision makers are familiar with focus on hardened approaches, such as sea walls and levees, which further degrade coastal ecosystems. In recent years, California State Policy has adjusted to permit the consideration of natural infrastructure, natural features or ecosystem processes, as alternatives to hardened infrastructure for protecting human communities. Natural infrastructure can potentially increase the quantity and improve the quality of coastal ecosystems while providing cost-effective flood protection for human communities. However, coastal decision makers need a better understanding of what natural infrastructure is, what options are feasible for the California coast and what technical standards they should use to design and implement natural infrastructure adaptation measures. Our project team worked with a technical advisory committee comprised of coastal decision makers and managers from throughout the state to develop guidance that would promote the consideration of natural infrastructure for sea level rise adaptation planning. I will present the process we used to develop the final products and what we learned along the way. In addition, I will present the guidance from our project and illustrate how we are delivering the information through web applications and how decision makers are using the information to guide their adaptation planning and implementation.

NEW TOOL FOR MONITORING LAND MANAGEMENT AND ITS BIODIVERSITY

Leonor Valenzuela, Wildlife Conservation Society; German Forero-Medina, Wildlife Conservation Society; Padu Franco, Wildlife Conservation Society; Isaac Goldstein, Wildlife Conservation Society; Johanna Gutierrez, Wildlife Conservation Society; David Pulgarin, Universidad Tecnológica de Pereira; Carlos Ríos, Wildlife Conservation Society

Management of terrestrial biodiversity requires monitoring the positive and negative effects of human activities, as this data enables us to take decisions regarding the development of such activities. However, this is not an easy task especially for government agencies with restrictions on staff and budget. Therefore, we present a simple tool that allows natural resource managers to estimate environmental balance of planned activities, using inputs from remote sensing and data related to each of the productive projects (i.e., mining, infrastructure, forestry, etc.). We used planned activities because with these authorities can exercise greater control. Terrestrial biodiversity management is focused in three conservation targets: forests - by type; distribution of focal species; and relative abundance of timber species. The development of the tool was possible using the integration of a database management system such as Postgis and MySQL and using open source servers as GeoServer and Zend Framework, which facilitates the access and the development of the tool because it works with open access and online

software. The developed monitoring tool enables the estimation of the state of each conservation target and the observed balances according to: all landscape, the set of planned activities (productive and conservation ones), and to each project level. It also estimates the expected balance for productive activities. Therefore, the monitoring can assist in the decision-making processes at different management levels, i.e., from the project level regarding to granting, modification or sanctions of the requested procedure; through the basic guidelines for defining environmental obligations (compensations and management plans) to regional environmental management related to watershed management plan and territorial management plans.

NEW VISIONS FOR THE CONSERVATION OF CHILE'S SOUTHERN PATAGONIA ICE FIELD

Fernando Iglesias Letelier, Round River Conservation Studies; Shalynn Pack, Round River Conservation Studies

Near the southernmost tip of the Americas lies Chile's largest national park, Bernardo O'Higgins. The Park protects over 35,000km2, including pristine fjords, the Southern Patagonia Ice Field, and the world's largest population of endangered huemul deer. The Park is largely unstudied due to its inaccessibility and lack of personnel, yet it lies at the front lines of climate change, as its borders legally retreat along with the glaciers. Unregulated tourism is encroaching from surrounding communities as the local economy shifts rapidly away from subsistence ranching. Since 2012, a U.S.-based non-profit, Round River Conservation Studies, has partnered with Chile's Corporación Nacional Forestal (CONAF) to conduct the first biodiversity surveys in the northern section of the Park. Round River pairs conservation scientists and student teams with CONAF personnel and local community members to conduct biological research and monitoring that will be directly applied to land management. So far, Round River has observed over 80 huemul in and around the Park, and transected over 240km of previously unexplored areas, documenting huemul, birds, and more than 40 plant species. On the eastern flank of the Park, Round River is working with Chile's Ministerio de Bienes Nacionales to establish a new conservation management area, the Bien Nacional Protegido Campo de Hielo Sur. This area would protect the pristine Pascua watershed and allow Round River to foster community-led conservation and tourism management, using spatial analyses of landscape values to provide partners with information on land use, economic opportunities, and conservation priority. We discuss the future of conservation around Chile's Southern Patagonia Ice Field, and explain how we utilize student programs to drive applied conservation research. How can conservationists, students, and communities work together to protect this wild yet rapidly changing ecosystem, while empowering sustainable local development?

NO TREATIES: BIOLOGICAL EVIDENCE IN SUPPORT OF ASSISTED COLONIZATION OF POLAR BEARS TO ANTARCTICA

Madison Hall, Michigan State University

The primary objective of this project was to examine the biological/ecological, political and sociological issues related to assisted colonization of *Ursus maritimus* to Antarctica. Primary research areas focused on the estimation of energetic needs for polar bear survival in Antarctica. Identification of likely Antarctic prey species. Exploration of polar bear geographic placement as a factor in Antarctic ecological resilience. Analysis of Antarctic polar bear population growth to determine a safe carrying capacity. By utilizing the Polar Bear Survival Map as a research compass, analyses show a workable path for placement of polar bears in Antarctica, as climate change induced habitat loss in the Arctic threatens its keystone species and apex predator with extinction. My dissertation explores the ethical question of wild population extinction vs. Antarctic ecological resiliency coupled with assisted colonization. By shifting the focus from an invasive species frame of reference to one of climate change survivability, we can explore a paradigm where a broad spectrum of wild polar bear genetic diversity, once safely placed in the Antarctic, may one day be brought back to the Arctic to flourish after a polar regime is climatically reestablished there.

OCCUPANCY OF A HABITAT SPECIALIST: WOODLAND STRUCTURE & OCCURRENCE OF A NEAR-THREATENED LOVEBIRD

Tiwonge Gawa, Museums of Malawi

The near-threatened Lilian's Lovebird *Agapornis Lilianae* is a small parrot endemic to the Zambezi basin in south-east Africa. The species has a fragmented distribution predominantly within Mopane woodlands and is widely referred to as a Mopane specialist. Mopane woodlands are currently under threat from charcoal burning and timber felling. This study investigated the relationship between current lovebird distribution and environmental variables with particular focus on understanding the importance of woodland type and the availability of surface water. Systematic field surveys were conducted throughout the previously known range of the species in Zambia, collecting data on species occurrence and habitat characteristics. We surveyed for the Lilian's lovebird in

114 plots in the Luangwa, Luano and Zambezi valleys and measured woodland structure at each plot. Using these data, we first investigated the association between lovebird occurrence and habitat structure. Results showed that the occurrence of Lilian's lovebird was positively associated with the size of Mopane trees (i.e., its height and diameter at breast height). This suggests that large Mopane trees are a key resource for the species and that conservation efforts targeted at the species should focus on protecting areas that contain these large trees. We failed to detect the species in the west of its former range, suggesting rapid contraction within the Zambezi valley. It may now be restricted in this region to the Lower Zambezi National Park highlighting the importance of protected areas for the species protection.

PARTICIPATORY APPROACH TO HUMAN-WILDLIFE CONFLICTS: EXAMPLE FROM THE JAGUAR IN THE BOLIVIAN AMAZON

Nuno Soares, Bolivian Association for Research and Conservation of Amazonian Andean Ecosystem; Luis Arteaga, Bolivian Association for Research and Conservation of Amazonian Andean Ecosystem; Kathrin Barboza, Bolivian Association for Research and Conservation of Amazonian Andean Ecosystem; Ruth Cayalo, University of Pando; Luis Dumay, University of Pando; Jenny Glikman, Institute for Conservation Research, San Diego Zoo Global; Gladys Guanacoma, Bolivian Association for Research and Conservation of Amazonian Andean Ecosystem; Silvio Marchini, University of Sao Paulo - ESALQ-USP; Marcos Terán, Bolivian Association for Research and Conservation of Amazonian Andean Ecosystem

Conservation conflicts (also known as Human-Wildlife conflicts) are a very common issue throughout the world, and are considered one of the main threats to several species, in particular large carnivores. The majority (90%) of the north of Bolivia is still covered by tropical forest and communities that live there coexist and interact with wildlife constantly. We evaluated the conflict between jaguars and people through 306 interviews (19.2% of the population) in 7 communities living inside two contiguous areas: the Manuripi National Amazonian Wildlife Reserve (MNAWR) and the Tacana II Indigenous Territory. People listed several species/taxonomic groups that threaten people's lives or livelihoods. Jaguar ranked 1st or 2nd depending on area. Differences between gender in beliefs, risk perception, emotions and tolerance were detected: Higher percentages of women have misbelieves, higher risk perception of jaguar attack, negative emotions and lower tolerance to the species. Almost half of the interviewed had killed jaguar or, in the case of women, their husband had killed jaguar. In MNAWR we developed several educational/outreach activities to approach some of the incorrect beliefs identified in the interviews: jaguar ecology, risk of jaguar attacks and jaguar abundance in the area. Post-activities evaluation to 51% of the people interviewed for diagnose reveals improvement in believes, risk perception, emotions and tolerance. Nevertheless, behavior intention (killing jaguar) wasn't significantly different when comparing people that participated in our educational/outreach activities with the one's that didn't. In the end communities identified activities that ultimately would reduce conflict and formally pledge, with a photo, to work in favor of coexistence with the jaguar under this activity plan.

PERCEPTION USE AND LOCAL CONSERVATION OF THE CROCODYLUS INTERMEDIUS IN ARAUCA RIVERS COMPLEX

Brigitte Preciado Salas, Asociación de Biólogos Ambientales, Universidad Javeriana; Sebastian Restrepo, Universidad Javeriana

The *Crocodylus intermedius*, an endemic species of the Orinoco basin, classified as Critically endangered by the IUCN, has four relictual populations in Colombia. The largest wild population is located in the basins of the Cravo Norte, Ele and Lipa (Arauca) rivers. Historical and current information about the uses and pressures on the species was collected, identifying that the collection of eggs, the use as pets and the trade of these individuals added to the historical hunting pressure for their skin have been determining factors that places the species in that category of threat. According to recent studies it seems that the population of this species located in the complex of rivers has recovered, possibly because of the sensitization of the local populations towards conservation. Considering that the National Conservation Program of the Caiman Llanero (Ministry of Environment, 2002) does not take into account the active participation of the communities and their knowledge in conservation, this research seeks to determine the contributions (current and future) of the social actors settled in the complex of rivers Cravo Norte, Ele and Lipa in the local conservation of the caiman llanero. The methodology is directed to the work and interaction with the social actors present in the study area. Likewise, a diagnosis will be made about the perception and current use of the species so that within the framework of this research local actions of knowledge and conservation of the species are formulated. The results are expected to complement the reformulation of the National Conservation Program of the caiman llanero and to be useful to decision makers for the elaboration of future conservation plans and actions.

PHYSIOLOGY AND SURVIVAL OF YELLOW WARBLERS WINTERING IN NATURAL AND AGRICULTURAL HABITATS IN MEXICO

Simon Valdez Juarez, Simon Fraser University

The loss, degradation and conversion of natural habitats in Central and South America has been implicated in the population declines of many migratory songbirds. However, few studies have evaluated how conversion of natural habitats to crops, other than coffee, influence the condition and over-winter survival of songbirds. The highest diversity of wintering Neotropical migrants is found in the lowlands of Mexico, where crops have extensively replaced native vegetation. We examined the potential impact of habitat conversion by comparing density, condition and over-winter survival of yellow warblers (*Setophaga petechia*) wintering both at natural (riparian gallery forest and coastal lagoon vegetation) and agricultural habitats in western Mexico. We estimated condition and over-winter survival for 216 birds between January and April 2012 to 2014 in 6 study plots (2/ habitat type). Yellow warbler density was highest in agricultural habitat, intermediate in riparian, and lowest in coastal lagoons. Birds in agricultural habitat did not gain mass over the course of the day and had higher stress levels (inferred from hematic profiles). However, birds on agriculture re-grew higher quality feathers than birds in natural habitats. Adult monthly apparent survival in agricultural habitat was similar to that of adults in riparian habitat (male: 96.7±0.4%; female: 94.9±0.4%;), while adults in coastal lagoons had lower monthly apparent survival (male:95.2 ±0.4%; female: 92.5±0.5%). We interpret the higher feather quality and survival as indicating that irrigated crops such as maize and sorghum provide high quality habitat for yellow warblers. The lack of daily mass gain could be a consequence of adaptive mass regulation and the higher stress levels due to increased antagonistic interactions at high densities. Further work is required to determine if our results can be generalized to other species or agricultural habitat with more intensively farmed crops.

POSITIVE RELATIONSHIPS BETWEEN CARBON STORAGE AND BIODIVERSITY ARE NOT PREDOMINANT AT LOCAL SCALES

Frederik Van de Perre, Universiteit Antwerpen; Steven Dessein, Botanic Garden Meise; Herwig Leirs, Universiteit Antwerpen; Steven Presley, University of Connecticut; Erik Verheyen, Universiteit Antwerpen; Michael Willig, University of Connecticut

The preservation of forest carbon stocks is a key strategy in the battle against climate change. The UN-REDD+ Program offers incentives for developing countries to reduce national deforestation rates and associated carbon emissions. These incentives could potentially mitigate climate change and at the same time conserve biodiversity. However, it remains uncertain whether preserving carbon stocks will safeguard biodiversity. The relationship between diversity and carbon storage is predominantly positive for trees, other trophic levels still remain understudied. Based on the first multi-taxon inventory in the Congo Basin, we assessed the relationship between biodiversity and aboveground carbon (AGC) using multiple metrics of taxonomic diversity for a broad spectrum of taxa, including primary producers (trees and lichens), decomposers (fungi and slime molds), and consumers (vertebrates and invertebrates). We used three different groups of taxonomic diversity metrics in our analyses: alpha diversity (species richness, Shannon and Simpson diversity), beta diversity (community dissimilarity), and species of conservation concern. When assessed at scales relevant for conservation, relationships between aspects of taxonomic diversity and AGC are taxon-specific. Apart from trees, only one taxon showed an increase in species richness or diversity with increasing AGC. Furthermore, our results show that for most taxa, community composition differs more between forests, when these forests have larger differences in carbon stock. These results demonstrate the importance of addressing multiple trophic levels and aspects of diversity in ecological research. Furthermore, our findings highlight the added value of regrowth forests for both biodiversity and carbon storage. The complexity of relationships between biodiversity and AGC indicates that biodiversity and carbon storage must be considered jointly to maximize co-benefits for forest conservation.

POTENTIAL FOR CARD RANKING METHODS TO UNDERSTAND CONSUMER DEMAND FOR WILDLIFE TRADE (CASE: DISCUS)

Anita KY Wan, University of Kent; David Roberts, University of Kent; Diogo Verissimo, Johns Hopkins University; Noreen von Cramon-Taubadel, University at Buffalo; Ian Watson, University of Kent

Growing wealth and international demand for wildlife products can bring increased risks of overexploitation in the wild, threatening species populations and ecosystem functions. As such, consumer-targeted approaches have been increasingly applied and experimented in attempt to reduce demand for the trade of endangered species, and if possible, garner support for alternatives to divert local interests towards sustainable livelihood options. To ensure the conservation and sustainable management of traded species, preference elicitation techniques can be used to obtain background understanding on push

and pull factors behind consumer purchases of wildlife products, and provide essential support to achieve heightened effectiveness of approaches. Here we attempt to trial and evaluate an adapted card sorting variant in rating standardized picture sorts, to obtain understanding on consumer interests and market demand of live animal products using the ornamental trade of discus (Symphysodon) as a case study. Boxplots and general linear models were applied to explore heterogeneity in preferences for phenotypic discus attributes and trade-off behavior between consumer groups based on socio-demographic background. Results saw international demand predominantly towards cultivated discus or refined natural traits, with general trends for wild and conservative cultivated traits from European market regions, and strong artificially cultivated discus interests for modern traits in Far East Asian markets. Colour was found to be of greatest influence to discus choices, with the greatest discrepancies in shape associated with varying standards and judgements for quality. Further methodological evaluations were examined with Spearman's rank correlations, and discussed for the potential in providing opportunities for comprehensive analyses on consumer demand, and supporting wider research and application towards the sustainable management of wildlife trade.

PRACTICAL APPLICATIONS OF IMAGING SCIENCE FOR CONSERVATION BIOLOGY

Ned Horning, American Museum of Natural History's Center for Biodiversity & Conservation; Peter Ersts, American Museum of Natural History's Center for Biodiversity and Conservation; Yagiz Sutcu, InfoScope LLC

Recent and continuing improvements in computer hardware technology along with developments in feature recognition through deep learning algorithms are making it possible to more accurately and efficiently identify objects, differentiate textures, and classify the contents in images and videos. Furthermore, developments of innovative and modular data acquisition platforms facilitated by the remarkable trend in miniaturization of sensor technologies and cost reduction of electronic components, the use of digital media in conservation biology research and practice is entering a new era. Leveraging new machine learning frameworks for feature recognition and classification we are developing a set of open-source tools focused on ecological and conservation biology applications. We will present recent work that highlights technological advances with examples of solutions to conservation challenges including automation of the identification of species in camera trap photos, counting animals and mapping land cover and land cover components.

PREDICTING MOVEMENTS OF VERTEBRATES WITH ROAD AND VISUAL SURVEYS IN A HUMAN-DOMINATED LANDSCAPE

Karen Root, Bowling Green State University; Lauren Jonaitis, Bowling Green State University

Road mortality has detrimental effects on wildlife. Individuals may be affected directly by collisions with vehicles causing mortality and populations may decline or indirectly by reduction in population connectivity as a result of habitat fragmentation. We examined structural features and environmental variables to better predict road mortality in the Oak Openings Region, a biodiversity hotspot in Northwest Ohio. About four times a week, May-October, we surveyed roads surrounding and within Oak Openings Preserve and Maumee State Forest, the largest protected areas, for all vertebrate taxa. We also performed daytime and nighttime surveys within the parks to account for sources of animal dispersal and dispersal corridors. During surveys we measured environmental variables (e.g., temperature, humidity, wind, rain) and structural characteristics (canopy, vegetation density, road features) to relate to roadkill probability and animal movement. We found 292 vertebrates dead on roads surrounding protected areas, including more mammals than any other taxa. Almost 44% of road mortality was found on one roadway (Waterville Swanton Road) that appears to be an area of frequent vertebrate crossings and mortality from vehicle collisions. During visual surveys, animal movement was primarily in the NW area of the Oak Openings preserve, which is adjacent to Waterville Swanton Road. Intermediate levels or no canopy on roads increased the number of road killed vertebrates for all surveyed months (Wilcoxon, $p<0.02$). Road structural features influenced mammal road mortality, but the effects varied among species. Specifically, the presence of agriculture fields, vertical road signs, grassy fields and water influenced mammal road morality during spring months (Chi-Square, $p<0.05$). Our approach can predict movement patterns and identify the features that may be managed to reduce road mortality, which is likely to be applicable to other reserves in human-dominated landscapes.

PROMOTING CITIZEN SCIENCE IN AGRICULTURAL LANDSCAPES INCREASING DATA USEFUL FOR BIRD CONSERVATION

Eduardo Alexandrino, Escola Superior de Agricultura "Luiz de Queiroz", University of Sao Paulo; Alex Bovo, Escola

Superior de Agricultura "Luiz de Queiroz", University of Sao Paulo; Maristela Camolesi, Universidade Federal de Sao Carlos, Campus Sorocaba; Katia Ferraz, Escola Superior de Agricultura "Luiz de Queiroz", University of Sao Paulo; Ana Navarro, Escola Superior de Agricultura "Luiz de Queiroz", University of Sao Paulo; Valdir Paulete, Universidade Metodista de Piracicaba; Cagan Sekercioglu, University of Utah

Birders are potential citizen scientists. Researchers and decision makers worldwide are considering birders' data to support conservation and ecology projects. In Brazil, the number of birders is increasing since early-century, however, conservation projects involving citizen scientists are extremely scarce. In addition, small forest patches in agricultural landscapes has less bird diversity when compared of large forest protected reserves, leading birders to do birdwatching at forest reserves. This behavior hinders bird data collection in agricultural landscapes and delay research projects concerned to promote bird conservation in this landscape. Thus, we created the project "I saw a banded bird? The birdwatching helping projects of applied ecology in forest patches" that challenges birders and locals to search for color banded birds in three small forest patches (96 ha, 61 ha and 38 ha) in agricultural landscapes of southeastern Brazil. Until the closing of this abstract, we have made four bird banding campaign each patch (Set/2016 – Jan/2017), where 202 forest individuals from 50 species were banded. Each individual received a unique band color sequence. As our first test, we did informal invitations for some birders and five felt motivated to search banded birds in our patches, which generated field data for 106 bird species. Five banded birds (of four species) were photographed into the forests, in a mean of 150 meters of our mist nest station. Our bird banding campaign will continue until June/2017. Locals are now receiving free classes of bird identification and monitoring and they learned to identify 50 bird species. In March/2017 we will broadcast our invitation for several Brazilian birders though social media and lectures in Brazil bird fairs. Although our project was not finished our previous results showed that Brazilian birders may felt challenged to collect bird data useful for ecological researches in agricultural landscapes.

PROMOTING COMMUNITY-BASED MANAGEMENT OF FISHERIES RESOURCES IN THE COLOMBIAN PACIFIC COAST

Pilar Herron, Ecomares Foundation; Adriana Arcos, Biocomercio Sostenible; Silvana Espinosa, Independent; Bernardo Orobio, Fondo Accion Ambiental

The mountain range known as Sierra de Las Cruces (SC), which separates the cities of Mexico and Toluca, is the most important source of ecosystem services for more than 20 million people, but land use change has dramatically reduced and fragmented the remaining native habitats. Domestic dogs (*Canis lupus familiaris*), are exotic species which can negatively affect wildlife by competition, predation and by being vectors of disease, all of which can lead to local extinctions. Carnivores provide services like pest control and seed dispersal. The aim of this work was to assess if landscape disturbances associated with human presence have an impact on wild carnivores. With camera traps we recorded the presence and abundance of native carnivores in SC, and used GLMs to determine if the distance from each camera to the nearest paved road and human settlement had an effect on the presence of wild carnivores. We also determined the activity patterns of the most abundant carnivores and evaluated the overlap between them. We found a surprisingly complete community of carnivores, and unexpectedly we found domestic dogs to be up to five times more abundant than the raccoon (Procyon lotor), the most common native carnivore. Abundance of the reminder 9 native carnivores recorded was low. The model shows that distance to the edge of the forest had an effect over ring-tailed cats. Some wild species may be adapting better to human disturbances by exploiting human resources more effectively. The presence of dogs also seems to be having an effect on the presence of bobcats, and their activity patterns overlap. While our data is not enough to assess the effect of dogs over wildlife, the abundance and wide distribution of dogs in the SC raises a flag keep monitoring the remaining patches of natural habitat where humans, domestic animals and wildlife coexist.

PUBLIC AQUARIUMS: HOW SUB-AQUATIC BIODIVERSITY ENCOUNTERS COULD HELP CONSERVATION EFFORTS

Deborah Cracknell, National Marine Aquarium; Michael Depledge, European Centre for Environment and Human Health; Sabine Pahl, University of Plymouth; Mathew White, European Centre for Environment and Human Health

Human activities are responsible for the dramatic loss of global biodiversity and people's growing disconnection from nature is likely to be hindering the will to reverse, or even slow, this decline. Some propose that nature should be incorporated into people's daily lives as evidence suggests that people who establish personal connections with nature are more likely to value and protect natural environments and the species therein. Research has found that such exposure to nature can also provide physical and mental health benefits, such as improved mood, reduced stress levels and lower blood pressure.

Furthermore, as studies based on terrestrial species have found that greater psychological well-being being may be associated with greater species richness, these studies can support the case for maintaining biodiversity, as well as providing evidence-based health advice that may encourage people to experience, and ultimately value, nature. In view of this, a series of studies investigated people's psychological and physiological reactions to different types of sub-aquatic biodiversity found within public aquariums. Findings revealed that aquarium exhibits were able to provide health and well-being benefits and, crucially, these benefits tended to be greater with greater species richness and/or abundance. Public aquariums can provide convenient access to nature and, for some people, offer some of the only opportunities they have to connect with marine life. Hence, it is suggested that meaningful encounters with nature in these settings could contribute to a greater appreciation of the natural world that, in turn, furthers conservation efforts by fostering greater pro-environmental behaviours and providing support for the maintenance of biodiversity. Additionally, engaging people with nature, via proxy settings such as public aquariums, could benefit natural environments by easing detrimental anthropogenic impacts such as wildlife disturbance and habitat destruction.

RANCHERS' PERCEPTIONS ABOUT INSTITUTIONS MANAGING CONFLICTS WITH JAGUARS AND PUMAS IN COSTA RICA

Natalia Valverde-Zúñiga, Programa Gente y Fauna; Ronit Amit, University of Florida; Susan Jacobson, University of Florida

When dealing with human-wildlife conflicts, institutions (government agencies, non-profit organizations, civic organizations) manage cases with varied approaches, but are frequently unaware of how stakeholders perceive their actions. Program evaluations should detect weaknesses and strengths for improving conflict resolution and collaboration. In this study, we examined baseline perceptions and integrated perspectives about institutions managing jaguars and pumas obtained from ranchers vulnerable to livestock predation in Costa Rica. In order to compile data on perceptions, we applied a semi-structured interview to a random sample of 162 ranchers (93 affected by livestock predation, and 69 non-affected), throughout the country. Mixed analysis revealed 86% of ranchers provided comments about institutions, although only 37% have received institutional support (in the form of information, supplies and compensation for damages). We found ranchers fail to differentiate among institutions, confounding personnel, projects, and institution names. Ranchers perceive unequal distribution of benefits with donations varying from a few collars with bells to many buffalos. Lack of follow up, with programs lasting around a year, is perceived as a limitation. Approaches by institutions still focus on wildlife protection instead of citizen satisfaction, as ranchers complain about broken agreements and impositions. We conclude that evaluation of effectiveness of human-wildlife programs need to incorporate feedback by locals, complementing persistence of conflictive events such as attacks by felids.

RARE BIRDS LOGGING AND LOCAL ECONOMY IN THE BIALOWIEZA FOREST, POLAND

Dorota Czeszczewik, Siedlce University of Natural Sciences and Humanities; Wieslaw Walankiewicz, Siedlce University of Natural Sciences and Humanities; Agnieszka Ginter, Siedlce University of Natural Sciences and Humanities;

Human fascination for rare birds is ancient. Recently when long distance traveling is easy, many birdwatchers are willing to pay money for possibility to see rare birds. Many birds require old-growth forests while forest management has traditionally centered on timber production. The Białowieża Forest (E Poland) is a realm of many rare European birds i.e., woodpeckers, flycatchers, owls, birds of prey. Unfortunately, long-term forest management lowered density of rare birds in much of the Białowieża Forest e.g., White-backed Woodpecker, Three-toed Woodpecker, Collared Flycatcher, Red-breasted Flycatcher. We aimed to assess how much income for inhabitants of the Białowieża community is provided by birdwatchers. Preliminary results showed that this specific group of tourists (who come mostly from abroad) brings significant part of the total income from tourism. This money goes mostly to the local community. Birdwatchers mainly visit the best preserved, protected parts of the Białowieża Forest (e.g., Białowieża National Park, BNP). However, BNP covers only 16% of all tree stands while the rest of the forest is managed by state forestry. Recently, we observe pressure to increase logging by state forestry which could reduce the densities of rare and interesting for birdwatchers birds, especially species associated with old-growth stands and dead wood. In view of above it is clear that, birdwatching will generate stable long–term income for the local community while profits from logging of old growth stands are achievable once for decades.

REALIGNMENT OF SEA TURTLE ISOTOPE STUDIES NEEDED TO MATCH CONSERVATION PRIORITIES

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Threatened Species Unit, QLD Department of Environment and Heritage Protection; Jason van de Merwe, Australian Rivers Institute, Griffith University

Understanding the geographic distribution of migrating taxa within their sub-populations could enhance conservation and management, especially for sub-populations that are the most threatened. For sea turtles, isotope techniques have been used for this purpose and have become popular in the past decade with an increasing year-to-year trend in published studies. However, there is also a mismatch when comparing research effort to conservation needs. For example, regional management units (RMUs) listed as of 'least concern' by the IUCN have been studied at a rate many times higher than those considered threatened. This may be a testimony to the effectiveness of research and management in these areas, but suggests a need to now realign the focus of sea turtle isotope ecology towards more threatened RMUs. There also remains a fundamental question around how the diet choices of individuals within foraging areas and across species may affect soft tissue isotopes and thus assignment success. We aim to address the mismatch with conservation needs by investigating the foraging distributions of critically endangered adult south Pacific loggerhead turtles. We also present a potential alternative method which uses the chemistry of commensal barnacle shells to infer the movement of their host. Preliminary data suggests this method may be useful in distinguishing between foraging areas without any influence of individual diet choices. It may also provide information on migration distance and be applicable across all sea turtle species (and other migrating taxa with commensal barnacles) without the need to develop baseline isotope signals using satellite telemetry or validation of methods for each host species.

RECONCILING BIODIVERSITY CONSERVATION AND MITIGATION OF CLIMATE CHANGE: THE POTENTIAL IN EUROPE

Kerstin Jantke, Universität Hamburg; Benjamin Blanz, Universität Hamburg; Jana Müller, Universität Hamburg; Natalie Trapp, Universität Hamburg

Biodiversity loss and climate change are inextricably linked. A key question to conservation science is how to effectively link biodiversity conservation and mitigation of climate change. While pristine ecosystems such as primary forests and intact mires are generally both biologically diverse and carbon dense, degraded ecosystems suffer from biodiversity loss and often show a decreased or even reversed carbon capture and storage capacity. We apply an inter-disciplinary approach combining GIS analyses, agricultural economics and statistics to analyse spatial relations between protected areas, soil carbon content, and land values in the European Union (EU) and to identify and quantify the proportion of land with high carbon and low economic value within and outside protected areas. Findings indicate a remarkable potential for climate-smart conservation in Europe. Protected areas capture a proportionately high fraction of carbon given that they were not designated for this purpose. Natura 2000 sites contain 10% more topsoil organic carbon than unprotected sites. At the same time, the land value of Natura 2000 sites is almost 15% less than that of unprotected sites. Inexpensive regions with high carbon content outside the current reserve system cover about 330,000 km² - predominantly located in northern and eastern Europe. Our findings have two major implications for land-based mitigation of climate change and biodiversity conservation. Firstly, a carbon-wise management of Natura 2000 sites with high soil carbon contents seems to be rewarding from a mitigation perspective. Secondly, the promising spatial relation between carbon and land values outside currently protected areas in the EU facilitate systematic conservation planning activities which take soil carbon as an additional input into account. Due to the interlinkage of biodiversity loss and climate change, these global societal challenges could thus be addressed synergistically.

RECOVERY OF AMPHIBIAN COMMUNITIES IN REGENERATING FOREST: TWO CASE STUDIES IN COSTA RICA

Michelle Thompson, Florida International University; Maureen Donnelly, Fiu, Biological Sciences

The extensive degradation of natural systems caused by anthropogenic activities is a pressing global conservation concern. There is hope that some of the negative impacts caused by forest loss such as reduction of ecosystem services and loss of biodiversity may be offset by the regeneration of altered landscapes to secondary forests. However, the value of secondary forests to fauna is poorly understood. In our study, we examine the differences in species richness among riparian and upland habitats in a chronosequence of secondary forest in two tropical lowland wet forest regions of Costa Rica. We found that riparian habitats maintain high species diversity in modified habitats and early successional stages of forests. In harsh landscapes, such as those generated as a result of land-use change, riparian zones may be especially crucial to maintaining amphibian populations by serving as a refuge for a variety of species.

RED BOOK OF REPTILES OF COLOMBIA (2015): UPDATE OF THE RISKS ASSESSMENT OF SEA TURTLES IN COLOMBIA

Cristian Ramirez Gallego, Fundación Tortugas del Mar; Karla Barrientos Muñoz, Fundación Tortugas del Mar; Vivian Páez, Universidad de Antioquia

Under the framework of the Annual Operative Plan (2015) for the Biodiversity Sciences Program of the Institute for Investigation of Biological Resources "Alexander von Humboldt", an evaluation of the risk of extinction of reptile species was conducted and the "Red Book of Reptiles of Colombia (2015)" was produced. Historically, in Colombia the turtles and crocodilians have been the focus of a heavy pressure, mainly for consumption followed by loss, transformation, and degradation of their habitats. Because the IUCN currently recommends an evaluation of the extinction risks to a species every eight year and the last evaluation for the class Reptilia in Colombia was conducted almost 13 years ago, a new evaluation was conducted using the five current IUCN criteria (2012) for 510 reptile species, including the five sea turtle species that occur in Colombia. In the case of the sea turtles, these were classified in different threat categories based on a variety of reasons, such as the reduced number of populations or mature individuals, and for the reduction and degradation of their habitats. The National Committee on Threatened Species and external evaluators reviewed the results of the categorization. Technical datasheets of the species that were evaluated with some category of threat (CR, EN, VU) were constructed. These include the description of the species, distribution and some basic aspects of its bioecology, threats, research and conservation's needs and opportunities, and finally, justification of the assigned category. Taking into account the threat level (from highest to lowest), sea turtles were listed as follows: The hawksbill turtle (*Eretmochelys imbricata*) (CR D), the loggerhead turtle (*Caretta caretta*) (CR A2cd; D), the leatherback turtle (*Dermochelys coriacea*) (CR A2cd), the green turtle (*Chelonia mydas*) (EN D), the olive ridley (*Lepidochelys olivacea*) (VU D1).

RELATING MAMMAL OCCURRENCE TO REMOTELY SENSED ECOSYSTEM FUNCTIONING IN FRAGMENTED LANDSCAPES

Bibiana Gómez-Valencia, Departamento de Ecología, Genética y Evolución, Universidad de Buenos Aires; Milton Cezar Ribeiro, Universidade Estadual de Sao Paulo; Jeffrey Thompson, Consejo Nacional de Ciencia y Tecnología de Paraguay, CONACYT & Guyra Paraguay; José Volante, Estación Experimental Agropecuaria INTA, Salta, Argentina

Understanding the consequences of habitat fragmentation is critical to preserving biodiversity and its role in maintaining ecosystem function. The functional heterogeneity of an ecosystem should be represented by the carbon capture and its temporal dynamics. Forests loss and fragmentation affect ecosystem function by altering patterns in primary carbon capture, particularly, land cover change into agricultural lands increases intra- and inter-annual variability. The relationship among mammals biodiversity patterns and functional attributes of ecosystems has been poorly studied. An ecosystem service provision index (ESPI) derived from satellite data, was developed as an aggregated indicator of the status and/or trends of ecosystem service supply. The ESPI it is based on two attributes of the seasonal dynamics of the Normalized Difference Vegetation Index (NDVI), related to C and water dynamics and biodiversity (avian richness). We used ESPI as a proxy for habitat heterogeneity and availability. We hypothesized a positive relationship between ESPI and mammals' richness and occurrence. We estimated the ESPI value at the landscape level during one hydrological year (2014). Terrestrial large and meso-mammal richness was estimated with multi-species occupancy modeling of camera trap data with the ESPI as a covariate on occurrence. We observed a low correlation (30%) between ESPI and forest area in the landscape. ESPI had no significant effect on estimated species richness at the landscape level. The relationship of ESPI with occurrence varied by species and was positive for *Tolypeutes matacus, Mazama gouazoubira, Chaetophractus vellerosus, Cerdocyon thous* and *Silvilagus brasiliensis*. Species of conservation concern would benefit from the ability to monitor changes in habitat heterogeneity and availability from functional attributes derived from remotely sensed data because they respond faster to environmental changes than structural attributes.

SACRED NATURAL PLACE AND ITS FOREST, CASE OF STUDY SALTLICKS (SALADOS) INTO INDIGENOUS COMMUNITIES

Ana Maria Monsalve Cuartas, Lisbon University; Ignacio Sanches, Nacional University

In Amazon rainforest landscapes there are several kinds of sacred sites for many indigenous communities. The goal of this study is to identify and characterize one kind of sacred site called a saltlick and analyze the state of its forest cover. To achieve this goal, an information collection was made related to the traditional stories of origin of the Tikuna and Uitoto communities of the Colombian Amazon Trapezium and to the biological resource management of sacred sites by this communities and saltlicks in particular. The indigenous reserves TICOYA and RITU were

visited several times to determine the study area and recognized some sacred sites. Then eleven saltlicks were selected and of each the dominant trees were identified. The perimeter forest of these saltlicks has conserved its structure, dynamic and functions. The ethical and spiritual perspective and management of the Tikuna and Uitotos communities that is applied to their use of these sites has allowed the conservation of their native flora biodiversity, richness and composition. The relationships between saltlicks and the indigenous communities were functionality under the sacred value. The perception of the indigenous communities Tikuna and Uitoto about saltlicks is based on knowledge transmitted by ancestors, cosmogony, myths of origin and cultural tradition. This acquaintance guides to respect and recognition of these sacred places. It is the interconnection of sacred sites such as saltlicks, caranasales, cananguchales, lakes, lagoons, elevated sites, hills and cachiveras that forms a larger sacred territory or sacred landscape. Thus, and physical threat for one specific site is also a larger spiritual threat for this web of sites in the territory, which goes beyond the boundaries of the indigenous reserves.

SEAFLOWER SCIENTIFIC EXPEDITION: CURRENT STATUS OF SEA TURTLES IN CAYO SERRANA ISLAND (COLOMBIA)

Karla Barrientos Muñoz, Fundación Tortugas del Mar; Cristian Ramirez Gallego, Fundación Tortugas del Mar

This expedition is part of the comprehensive strategy for the exercise of sovereignty over San Andrés and Providencia, designed by the Presidency of the Republic to strengthen the management and conservation of the Seaflower Biosphere Reserve. In Colombia, there are five of the seven living species of sea turtles, all of them under some risk of extinction. Of these, four are in the Colombian Caribbean and three have been reported in Cayo Serrana Island. Since 1998, no studies have been conducted on sea turtles on the Island ignoring the current status of these species. Due to this lack of knowledge, research initiatives assessing the current status of sea turtles in the area, become highly relevant to contributing to the current conservation efforts in the Greater Caribbean. This project was carried out within the framework of the III Seaflower expedition. It represents the first comprehensive study at the national level in this area, providing novel information on the distribution, abundance of sea turtles in nesting and foraging areas. Three species were confirmed by sighting in the area: the loggerhead turtle (*Caretta caretta*), hawksbill (*Eretmochelys imbricata*) and green turtle (*Chelonia mydas*). The loggerhead turtle and hawksbill are present in the terrestrial zone using Cayo Serrana as nesting area and the hawksbill and green turtle are present in foraging areas. The records allow us to confirm, for now, that Cayo Serrana Island is currently the main nesting site of the loggerhead turtle and possibly of the hawksbill turtle in the Colombian Caribbean. Therefore, our results demonstrate the relevance of monitoring and conducting research studies on the nesting colonies of both species in Cayo Serrana, to strengthen the management and conservation of these endangered species in the Seaflower Biosphere Reserve. [Note: The results are presented during the congress, but the deadline for the summary is before the data analysis]

SELVA LACANDONA PRIORITY ENDANGERED SPECIES: CURRENT STATE AND ACTIONS FOR THEIR CONSERVATION

Francisco Roldán Velasco, Comisión Nacional de Áreas Naturales Protegidas, CONANP; Sergio Montes Quintero, Comisión Nacional de Áreas Naturales Protegidas, CONANP; Angélica Zambrano Ríos, Comisión Nacional de Áreas Naturales Protegidas, CONANP

Selva Lacandona is home to the largest remnant of tropical rainforest in Mexico, however its vegetation cover has been heavily affected by deforestation, particularly outside protected areas. The region is one of the most biological diverse in the country and a large number of species in danger of extinction are found in it. Jaguar (*Panthera onca*), Baird´s Tapir (*Tapirus bairdii*), White-lipped Peccary (*Tayassu pecari*), Geoffroy´s Spider Monkey (*Ateles geoffroyi*), Yucatan Black Howler Monkey (*Alouatta pigra*) and Scarlet Macaw (*Ara macao*) are considered the six priority endangered wildlife species within the federal protected natural areas. They face a wide array of problems, including habitat loss, hunting for different reasons, capture for pet market and loss of habitat connectivity. In order to palliate these threats, CONANP carries out different actions focused on their conservation and among them, the integration of communities in these activities is of great importance. Formation of communal monitoring and monitoring groups, work to reduce the conflict that these species have with productive activities such as cattle raising and agriculture, community workshops and conferences that present the problems they face and in which is emphasize the ecological importance they have within the ecosystem, the realization of environmental fairs, the attention to individuals considered at risk, among other activities, are part of this labour. Present work gives an overview of the situation of these species in the region, of the problems they face and of the work carried out in their favor.

SILVERY BROWN TAMARIN HABITAT CONNECTIVITY IN HETEROGENEOUS HUMAN-MODIFIED HABITATS IN COLOMBIA

Lina M Valencia, University of Texas, Austin; Anthony Di Fiore, University of Texas, Austin

A comprehensive understanding of how human disturbance affects tropical forest ecosystems is critical for the mitigation of future losses in global biodiversity. Changes in landscape characteristics due to habitat loss and fragmentation have been identified as major determinants of an animal's movement patterns and dispersal and are considered the main threats to the survival of many primate species. Of the 31 primate species in Colombia, 27 suffer from ongoing habitat fragmentation, and, of these species, six are considered endangered by the IUCN. The silvery brown tamarin (*Saguinus leucopus*), an endemic primate of Colombia, is classified as Endangered (EN) due to a serious reduction in population size over the past 3 generations because of ongoing threats including deforestation and live capture for the pet trade. This species does not occur in any protected area and its remnant populations are distributed in areas of intensive colonization and forest loss affected mainly by cattle ranching and agriculture. In this study we used a circuit theory approach and least-corridor techniques to map landscape permeability and identify areas that represent potential corridors for the maintenance of landscape functionality for the silvery brown tamarin in the states of Caldas and Antioquia, Colombia. We modeled landscape permeability based on land cover, topography and human disturbance and measured the resistance distance between selected extant populations to asses all possible pathways between any two populations. We propose areas that are most suitable for the construction and maintenance of ecological corridors in heterogeneous, human-modified habitats, and identify young secondary/regrowth forest as suitable habitat for tamarin dispersal. Our results stress the importance of considering the relative effect of different matrix habitat classes when inferring habitat corridors instead of assuming that all "non- suitable" habitats have a uniform effect on dispersal.

SNOW LEOPARD GOVERNANCE: DEMOCRACIES, MONOPOLIES AND INSTITUTIONALIZED PREDATORS

Falk Huettmann, University of Alaska

The snow leopard (*Panthera uncia*) is a conservation celebrity. With man-made climate change its status got even further elevated. However, snow leopard governance is widely distributed over more than 14 nations in the Hindu-Kush Himalaya region and many outside drivers exist to overrule local policy (if present). This study is based on a list and subsequent assessment of all available snow leopard management regimes, and it contrasts them with funders, available budgets, funding aims, open access data availability, development aid, driving religions, protection levels and democracy indices. The result of this meta-analysis shows us a widely skewed and imbalanced profile for an effective and democracy-based snow leopard management. The role of 'science' is relatively small. A major finding from this study shows that the relevance of prey and habitat is widely ignored. Using climate IPCC change forecasts scenarios, I elaborate what the future holds for this predator of global concern under such a 'governance' model such is not pre-cautionary.

SOCIOECONOMIC FACTORS ASSOCIATED WITH THE DISTRIBUTION OF AN INVASIVE TREE IN HAWAII

Rebecca Niemiec, Stanford University Emmett Interdiscplinary Program in Environment and Resources; Nicole Ardoin, Stanford University; Gregory Asner, Carnegie Institution; Philip Broderick, Carnegie Institution

To reduce the spread and impacts of invasive species in human-dominated landscapes, numerous and diverse residents often need to engage in individual as well as collective invasive species control efforts on their property and in their community. Combatting invasion thus requires an understanding of what socioeconomic factors, in addition to ecological factors, may slow the spread of an invader or facilitate its spread. However, few studies have examined associations between invasive species across the landscape and household and community-level socioeconomic factors, which may influence residents' decisions to control invaders. In this study, we combine spatially explicit social and environmental datasets, and we apply boosted regression trees to examine the socioeconomic, land use, and environmental factors associated with the distribution of an invasive tree species, albizia (*Falcataria moluccana*), in Hawai'i. We find that socioeconomic variables improve the ability to predict albizia distributions at the scale of a 10,000-ha housing subdivision, but not at the scale of the larger district. At the subdivision scale, albizia is more common on properties with absentee landowners as well as on properties of less-wealthy landowners, as indicated by low- or zero-building values registered in county tax map key data. Albizia is also more common on smaller properties and non-agricultural land. Our study provides policy recommendations for reducing the spread of invaders based on these findings and outlines an approach using computation machine learning for examining the

socioeconomic and environmental factors associated with invasion in complex social landscapes.

SOLUTIONS TO THE DATA-LIMITED DILEMMA: USING VISUAL SURVEY DATA TO ASSESS CORAL REEF FISH

Kendra Karr, Environmental Defense Fund; Rod Fujita, Environmental Defense Fund; Jake Kritzer, Environmental Defense Fund

Failure to assess fish stocks increases the risk of stock collapse and the loss of benefits associated with fisheries. Coral reef fisheries often lack catch, effort, and other types of data typically used for assessment and management, but some coral reefs have been extensively studied using visual surveys. Here, we present a data-limited assessment method that uses fishery-independent visual surveys to assess reef fish populations. Using the finfish fishery Belize as a case study, species-habitat relationships were modeled to estimate the densities of commercial fish targets by size classes from visual census data. Each model is used to predict the probability of encountering high proportions of each size class, these predictions can be treated as spatial explicit fishery independent abundance indices that can be used to drive stock assessments using data limited methods. Based on predictions of densities across the reef, fishing pressure has been most intense on mature adults and megaspawners as indicated by the ratio of fished to unfished biomass, but fishing pressure appears to be at sustainable levels for all maturity classes (juveniles, adults, and megaspawners). Fishery independent estimates of length composition and fished:unfished density ratios may prove useful for fisheries that lack fisheries data but are rich in fishery independent survey data that are quick and easy to collect, and in which catch limits (with associated monitoring and accountability measures) are difficult to implement and thus may be more amenable to spatial harvest control rules. Additionally, if the visual survey data are synoptic, predictions of length class abundance can be made over a wide range of spatial scales, facilitating the assessment of stocks at scales commensurate with sub-stock structure and/or fishery jurisdictions, reducing the risk of local depletion caused by mismatches between the scale of assessment and the scale of adaptive management.

SPREADING LIKE WILDFIRE: QUANTIFYING ADOPTION SPREAD OF PRIVATELY PROTECTED AREAS

Carla Archibald, The University of Queensland

Protected areas help to achieve long-term species and ecosystem conservation, and establishing more protected areas to meet conservation obligations is often high on governments agendas. To meet conservation obligations, many countries are now looking beyond publicly protected areas and turning to alternative conservation arrangements such as privately protected areas. Privately protected area programs, relying on landholder participation, have notoriously low adoption rates, which is documented to be a major barrier for this action to contribute toward national and international conservation targets. To address this, it is important to identify factors that facilitate privately protected area adoption within particular contexts. Using Australia's privately protected area system as a case-study, I identify how incentive type, social, economic and environmental factors affect the rate of adoption of privately protected areas. I adapt an epidemiology model to estimate property level and community level drivers, as well as categorise properties and communities into particular social and spatial groups to identify trends in adoption. Untangling community level predictors of privately protected area adoption will allow for decision-makers to establish links between property level drivers and boarder-scale community level drivers, which can support conservation planning efforts. Adoption patterns in different social and spatial groups can also uncover behavioral similarities within groups to provide insights into future program design. Locating hot spots, and cold spots, for private land conservation at a property and community level is a key step to engage the growing and enthusiastic private land conservation sector.

STAKEHOLDERS' PERSPECTIVES ON SPECIES MANAGEMENT, PRIORITISING ACTIONS TO PRESERVE OUR BIODIVERSITY

Hernan Caceres, The University of Queensland; Scott Atkinson, University of Queensland; Katrina Davis, University of Queensland; Salit Kark, The University of Queensland

While it is well-known that incorporating the perspectives and preferences of communities may lead to better conservation outcomes (i.e., long-term commitments, active participation, etc.), it is not a common practice. The literature describes several techniques to engage with the private sector, government agencies, and communities in conservation planning, but these are not applied mostly due to the challenges of achieving consensus (e.g., timeframe, existing plans, and clashing objectives). The prevalent practice often involves an individual assessment, and then to await for managers to make decisions. In this project, we identified and incorporated the various perspectives and preferences of different stakeholders in Minjerribah-North Stradbroke Island (QLD, Australia), regarding the conservation of threatened, and culturally

relevant species that are being impacted by 2 of the most successful invasive alien species in Australia: feral cats (*Felis catus*) and red foxes (*Vulpes vulpes*). We assessed the priorities and perceptions of multiple stakeholders from community groups, the private sector, and government agencies, in a spatially and temporally-explicit way. This approach reduces the gap between practitioners, the private sector, and community groups, by encouraging involvement and long-term commitment. It provides a platform for better understanding between participants, reduces management uncertainties, and facilitates the development of a unified management plan for culturally relevant, threatened, and invasive alien species in highly-vulnerable environments such as islands.

SURVEYING BAT POPULATIONS ALONG DRIVING TRANSECTS A COMPARISON OF METHODS

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Monitoring bat populations over large geographic areas poses significant logistical and financial challenges. One increasingly popular technique that partially overcomes these is to continuously record bats using a bat detector along driving transects. While expanding the geographic reach of studies on a smaller budget, this approach has its own limitations. For instance, the types of statistical analyses that can be performed on data recorded continuously are limited. Moreover, wind interference while driving can render data from high sensitivity microphones useless, reducing bat detections. One solution to these problems is to sample at stationary sites at regular intervals along each transect. The purpose of this study was to compare the amount and quality of data obtainable from these two techniques using high and low sensitivity detectors. Continuous sampling occurred while driving along 26 18 km transects, as well as for 12 minutes each at 10 stationary sites spaced 2 km apart, using a Wildlife Acoustics EM3 and Binary Acoustic Technology miniMIC in the summer of 2014. Due to airflow interference while driving, the higher sensitivity miniMIC was restricted to stationary sites. EM3 passes per minute were similar between continuous (0.067/min) and stationary sites (0.073/min). Percent of passes identified to species was also similar (20% continuous, 24.5% stationary). However, the miniMIC recorded vastly higher numbers of passes (1.13/min) with significantly more identified to species (64.1%, $p < 0.001$). Habitat preference results were largely similar in all analyses, though some differences (to be discussed) were noted. As long as higher sensitivity mics are not capable of continuous recording on driving transects, their vastly superior performance in number of calls recorded and identified to species suggests stationary sampling is preferable to continuous sampling on driving transects due dramatically higher yields in amount and quality of data.

SURVIVING IN UNPROTECTED LANDSCAPES: ENDEMIC AMPHIBIANS OF THE NORTHERN ANDES AND HUMAN THREATS

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Protected areas are important tools for conserving biological diversity. In countries with both high species and beta diversity these areas have proven insufficient. To conserve biodiversity outside protected areas thus emerges as a need. In the northern Andes 47 percent of the endemic species of amphibians are not or scarcely represented in parks and reserves. An assessment of the likelihood of relying on unprotected landscapes to conserve them suggests that it would be feasible. Unprotected regions holding overlapping distributions of endemic species exhibit a human footprint as low as that determined for protected areas. To rely on unprotected landscapes seems an opportunity to safeguard the high richness of amphibians including the unique assemblage of evolutionary different and globally endangered species of the northern Andes.

TEMPORAL CHANGES IN AVIAN ABUNDANCE-OCCUPANCY RELATIONSHIPS OVER 40 YEARS

Lisa Manne, City University of New York; Shannon Curley, Graduate Center, City University of New York; Richard Veit, CUNY, College of Staten Island

Abundance-occupancy relationships are widely documented for many organismal groups and regions. Abundance-occupancy relationships have been used to gain an understanding of regional population and community trends, and are particularly useful because declining abundance is not always accompanied by declines in range. Having the information provided by both occupancy and abundance, and monitoring changes in both over time may be required to document changes in conservation status/needs for some species, and to respond in a timely manner. We hypothesize that if there is a higher proportion of declining species in one group of species compared to another (e.g., migratory species vs. permanent residents), then a consequence of that difference will be a vastly different abundance-occupancy relationship between the two groups. Moreover, if this difference persists through time, then the resulting abundance-occupancy relationships between the groups will diverge. For neotropical migratory birds, short-distance

migrants and permanent residents of North America, we assessed the numbers of declining species (in abundance, in breeding range, and in number of detections per sampling episode) in the years 1969-2009, and found significant differences in numbers of declining species across the groups of bird species. We further tested for differences in the A-O relationship across these three groups, and found a significant declining abundance-occupancy relationship for permanent residents over the 40 years, a significant increasing abundance-occupancy relationship for neotropical migrants, and a non-significant declining abundance-occupancy relationship for short-distance migrants. Thus, the rate of increase of abundance with increasing occupancy is slowing for permanent residents, and increasing for neotropical migrants. We grouped species of similar morphologies, geographies and diets to further asses likely correlates of these changes.

THE AVIAN SCAVENGER CRISIS EXTINCTIONS TROPHIC CASCADES AND LOSS OF CRITICAL ECOSYSTEM FUNCTIONS

Cagan Sekercioglu, University of Utah; Evan Buechley, University of Utah

Vultures, which are the only obligate vertebrate scavengers, have experienced the most rapid decline in conservation status of any group of birds over the past decade and comprise the most threatened avian functional guild in the world. Of the 22 vulture species, nine are critically endangered, three are endangered, four are near threatened, and six are least concern. Meanwhile, the vast majority of avian facultative scavenger species, such as corvids and gulls, have stable or increasing populations. We analyze the causes of this stark contrast in status and evaluate what ecological factors contribute to extinction risk for all 106 avian scavenger species. A random forest model shows that diet breadth, proportion scavenged diet, geographic realm, body mass, clutch size and taxonomy are leading predictors of extinction risk. Meanwhile, dietary toxins –most notably poisons and the veterinary drug diclofenac – are by far the most important anthropogenic threat to avian scavengers, comprising the leading cause of decline for 59% of threatened avian scavenger species and 88% of threatened vulture species. Currently, 73% of vulture species are extinction-prone (near threatened, vulnerable, endangered, critically endangered and extinct) and 77% have declining populations, while only 13% of avian facultative scavenger species are extinction-prone and 70% have stable or increasing populations. As vultures' decline, populations of many facultative scavengers are growing, causing trophic cascades from increased predation, competition, and invasion. Furthermore, vultures' highly specialized digestive systems efficiently eradicate diseases when consuming carrion, whereas facultative scavengers are more susceptible to contract and transmit diseases among themselves and to humans. We urge immediate action, particularly by regulating lethal dietary toxins, to prevent the extinction of vultures and loss of respective ecosystem services.

THE CAMERA TRAP: AN ALTERNATIVE APPROACH TO THE STUDY AND CONSERVATION OF LARGE FELINES IN PANAMA

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Presently, it is a critical moment for the jaguar (*Panthera onca*) in Panama. The Panamanian laws catalog this feline as critically endangered (CR), due to hunting and habitat loss. This study evaluates the current situation of large cats and their prey in Santa Fe National Park, by directly involving the people who live in areas of conflict with these animals. To achieve these objectives, 25 workshops were held on the use and manipulation of traps and alternatives for minimizing conflict with big cats. 35 camera traps were installed with the residents of the area, for a period of 18 continuous months. This resulted in a sampling effort of 3950 trapping nights, covering an area of 30 km2 on the Pacific slope and 12 km2 on the Caribbean slope of the Park. We found a diversity of mammals, ranging in 17 families, 25 genera and 29 species. All six of the species of felines registered for Panama and Central America, appeared in our camera traps in Santa Fe. The two most abundant species were the puma (*Puma concolor*) and the ocelot (*Leopardus pardalis*) with an abundance index (AI) of 1.5 on average. For the jaguar, six individuals were identified with an AI of 0.7. The most abundant prey species was the ñeque (*Dasyprocta punctata*) with an AI of 8.2. We also report photographic evidence of rare species, highlighting the bush dog (*Speothos venaticus*), the tapir (*Tapirus bairdii*), the long-tailed weasel (*Mustela frenata*) and the northern naked-tailed armadillo (*Cabassous centralis*). Here we present the abundance data on the community of animals in Santa Fe National Park as well as demonstrate local community involvement in research as a method to conserve and manage human relations with large cats in Panama.

THE CONTRIBUTION OF PREDATORS TO ECOSYSTEM SERVICES AND DISSERVICES IN AGRICULTURAL LANDSCAPES

Matthias Tschumi, Lund University

The ongoing simplification of landscapes due to agricultural intensification comes at the cost of adverse effects on farmland biodiversity. While the effects on farmland biodiversity are increasingly studied, we lack an understanding of the effects on the relative contribution of individual taxonomic groups to ecosystem services (ES) and disservices (DS). We studied the contribution of birds, small mammals and invertebrates to service and disservice provision in 16 cereal fields along a landscape complexity gradient. From May till November 2016 we provided weed (predation is an ES) and crop (predation is a DS) seeds, as well as pest (ES) and beneficial (DS) invertebrate prey to predators. Results suggest that predation rates by vertebrates and invertebrates differ between the offered resources and that contributions vary over time. Early in the season animal prey was primarily consumed by invertebrates, whereas vertebrates became more important later. Seed predation was dominated by vertebrates across the entire season. The additional use of wildlife cameras showed that mice were responsible for 87% of the predation by vertebrates – whereas birds only accounted for 13%. For some sample dates, birds were more often recorded in fields adjacent to semi-natural grasslands compared to fields next to another crop field. Vertebrates and invertebrates provide important ecosystem services due to the predation of pest invertebrates and weed seeds. However, as beneficial invertebrates and crop seeds were often consumed to a similar or even higher extent, our results raise concerns that enhancing service providers comes at the cost of simultaneous increases in disservices. This study addresses an important knowledge gap about interactions between landscape composition, service and disservice provision by different taxa and helps identifying conditions for a high service-to-disservice ratio in future conservation strategies.

THE EFFECTS OF TROPICAL FOREST FRAGMENTATION ON HUMMINGBIRD MEDIATED POLLEN FLOW

Felipe Torres, University of Toronto; Adam Hadley, University of Toronto - Oregon State University; Helene Wagner, University of Toronto; Julie Wang, University of Toronto

Pollen-mediated gene flow is the avenue that maintains genetic diversity within seeds. However, if forest fragmentation limits the movement behavior of pollinators, then the quality of pollination services may be reduced, thereby catalyzing the loss of seed genetic diversity in small and isolated habitat patches. We assessed the cascading effect of hummingbird pollinator response to tropical forest fragmentation on genetic diversity of Heliconia tortuosa seeds. This plant is a tropical forest keystone species that is mostly pollinated by traplining hummingbirds that avoid crossing non-forested areas. Pre-dispersal seeds, sampled near Las Cruces Biological Station in Costa Rica, were collected from mother plants in a stratified random sample of 33 forest patches (five plants per patch, three seeds per plant) that varied in forest patch size and amount of surrounding forest. Linear mixed models of observed heterozygosity (based on 11 microsatellite loci) showed an effect of patch size and a weak interaction between patch size and connectivity. Seeds from small-isolated patches presented low mean observed heterozygosity, while seeds from large or connected patches revealed higher levels of genetic diversity. This suggests that change in pollinator movement behavior due to forest fragmentation affects gene flow in *H. tortuosa*, decreasing the quality of pollination in patches that are small and isolated. To overcome the negative effects of fragmentation on seed genetic diversity, and to ensure long-term population fitness, increasing patch size and enhancing genetic connectivity in small-isolated fragments must be a priority.

THE EXTENT AND PREDICTABILITY OF THE BIODIVERSITY-CARBON CORRELATION

Moreno Di Marco, CSIRO; David Currie, University of Ottawa; Hugh Possingham, The Nature Conservancy; Oscar Venter, University of Northern British Columbia; James Watson, Wildlife Conservation Society

Carbon conservation schemes, most notably the REDD+, are primarily aimed at combating climate change, but have also direct implications for biodiversity conservation. A positive biodiversity impact from these schemes is expected where areas with high carbon density are also highly valuable for biodiversity. However, reducing deforestation in a carbon-rich area might also have negative impacts, if the deforestation is displaced in areas with higher biodiversity content. We evaluated how the correlation between carbon and species richness varies across spatial extents (global to local), and whether the strength of the correlation can be predicted. We found that at least two general principles apply. First, the correlation is weaker when moving from a global extent to a local extent. Second, at local extents (i.e., within individual ecoregions) a positive correlation is more likely to emerge if both species richness and carbon density vary as predictable functions of climatic and environmental variables. Despite high heterogeneity across ecoregions,

we found that there are still opportunities to pursue local carbon conservation with high biodiversity co-benefits. For example, high correlation values were observed in 20% of tropical ecoregions. Recognising synergies and trade-offs among global conservation goals is of crucial importance to ensure that options for co-benefits are secured before being lost. However, pursuing carbon conservation with biodiversity co-benefits requires being strategic in terms of which spatial extent is more appropriate for planning, and which regions are more likely to deliver co-benefits. Simplistic assumptions that there is a linear relationship between carbon and biodiversity can lead to major issues for both sides of the relationship, when prioritising the other side.

THE MANTA IN THE ROOM: CHALLENGES OF SHARK AND RAY CONSERVATION IN THE PHILIPPINES

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Community engagement, co-management and community-based management are buzzwords in conservation circles in the Philippines. Many conservation projects claim to involve all stakeholders in the planning, implementation and evaluation of project activities and outcomes. In reality, however, participation of community stakeholders in policy-making or national-level planning is rare or non-existent. This study presents the case of shark and ray conservation planning and policy-making in the Philippines. The shark and ray conservation movement has reached a new hype in the country. A movement that emerged in 2009 from the camps of environmental groups and conservation non-government organizations. The movement has recently gained new ground with the success of including all species of mobulids in CITES Appendix II and with the revised Fisheries Code of the Philippines seeking to protect all species of sharks and rays. Several meetings and workshops have been conducted in the past five years discussing shark and ray conservation in the Philippines mainly aiming to ban the fisheries. None of these included discussions on the socio-economic and cultural impacts on fishing communities and how proposed policies should address these impending effects. The absence of fishing community stakeholders in these discussions is glaring. Despite long-standing evidence of the dependence of thousands of fishers and communities on shark and ray fisheries, this reality has been largely ignored. Using social science methods, this study aims to show that the lack of community engagement in shark and ray conservation in the Philippines has created and nurtured contestations among various groups. This challenge has impeded success in designing socially-equitable conservation policies. If marine species conservation policies are to work, real stakeholder engagement is crucial. An alternative approach of integrating a greater variety of voices and perspectives is recommended.

THE ROLE OF NICHE BREATH IN SHAPING SPECIES ABUNDANCE IN SEASONALLY DRY TROPICAL FORESTS IN COLOMBIA

Natalia Norden, Instituto Alexander von Humboldt; Gabriel Arellano, STRI; Hernando García, Instituto Alexander von Humboldt; Roy González, Instituto Alexander von Humboldt; Maria Natalia Umaña, University of Maryland

Variation in species abundance and distribution across regions are central subjects of community ecology. Many case studies have shown that species local abundance is positively correlated with their spatial distribution across several groups of taxa. A common explanation for this pattern is that abundant species have larger niches, so that they are able to recruit successfully across different habitats; while rare species exhibit narrower niches. This hypothesis has found support in tropical lowland and highland forests. However, our understanding on the patterns of tree species abundance is still limited in seasonally dry tropical forests (SDTF), one of the most threatened biomes in the tropics. Here, we evaluated patterns of species frequency and local abundance and environmental variables to determine the relationship between tree species dominance and niche breath in Colombian tropical dry forests, based on a network of 16 1-ha plots. Our results showed that, contrary to our expectations, total species abundance tends to be negatively correlated with species niche breadth. This is, abundant species tend to exhibit narrower niche strategies than the expected based on their frequency; while rare species tend to exhibit larger niches. However, the most common species (40 species out of 611) in tropical dry forest exhibit strong dominance (h-index = 6.9%, a metric measuring commonness across regions), indicating that these species are both frequent and abundant across plots. Together, these results suggest that SDTF do not follow the same assembly patterns than other types of tropical forests. The strong dominance of common tree species might be related to their capacity to cope with dry conditions. Overall, understanding the drivers of species abundance is a critical step to predict the fate of biodiversity in ecosystems facing high levels of disturbance such as in SDTF.

TIGER CONSERVATION BEYOND PROTECTED AREA BOUNDARIES IN THE CENTRAL TERAI LANDSCAPE, INDIA

Rekha Warrier, Colorado State University; Barry Noon, Colorado State University;

This research is located in the Central Terai Landscape (CTL) in northern India where the extension of Tiger (*Panthera tigris*) conservation measures beyond protected area (PA) boundaries is a principal goal. In the CTL, small but globally significant populations of tigers occur within insular protected areas embedded in a landscape comprising of sugarcane cultivation and dense human settlements. Tigers often occur beyond the boundaries of PAs in the CTL, in the larger landscape on account of dispersal related movements and the presence of favored resources. Beyond PA boundaries land-use alterations and human wildlife conflicts are chronic and acute threats that affect the persistence probabilities of tigers. The goal of our research was to determine the spatio-temporal patterns of habitat use by tigers in the human dominated areas of the CTL to guide the development of a land-use policy and a human-tiger conflict prevention strategy. Between November 2015 and August 2016, we generated data on seasonal tiger habitat use patterns in a 1200 sq. km study site separating two tiger reserves (Dudhwa & Pilibhit Tiger Reserve) in the landscape. We generated tiger presence-absence data within ninety, 2 sq. km grid cells by employing multiple methods including farmer interviews, camera trapping and animal sign surveys. We used multiple method false positive occupancy models that correct for positive and negative biases in the data to estimate seasonal habitat use probabilities by tigers and the spatial correlates of habitat use. Preliminary analysis suggest that tiger habitat use probability is highest ($p=0.66$, $SE = 0.05$) in the winter season corresponding with a period of maximum cover availability on account of ripe sugarcane crops. Further analyses are ongoing to determine the spatial correlates of sites experiencing high use probabilities. We believe that the results of this study will be instructive to carnivore conservation efforts in all human dominated landscapes.

TOURISM AS A STRATEGY FOR THE LONG-TERM SUSTAINABILITY OF COMMUNITY-BASED CONSERVATION PROJECT

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The Campesino community of Corosha, located in Northern Peru's Tropical Andes, designated ~2000ha as a protected area for their watersheds in 2001 and had it legally recognized as a Private Area of Conservation (ACP) in 2011. This area harbors rare and endemic species such as the yellow-tailed woolly monkeys, Andean night monkeys, and Andean bears. Even though only 32.2% of the community inhabitants are native to that locality, most had minimum expectations of their ACP, with water protection being their main concern. As the population has grown by 30% in the last 10 years, the potential for anthropogenic pressure to influence pristine areas has increased. After almost a decade of conservation practices (e.g., no hunting of endangered species), bears have returned to the area in unusually high numbers: eight individuals are seen regularly. Given that wildlife is abundant and habituated to human presence, the community started a tourism project in 2015 that involved the creation of associations for lodging and guiding services. Initially 25% of the community participated in tourism workshops and internships, however, after 3 months the number diminished to 15% given the responsibilities of participating, including monitoring of wildlife to assess the impact of visitors. Nonetheless, 68% of the community views the activities in a positive light. Since the beginning of the project, 138 visitors have come to Corosha, leaving approximately US$42 per visitor in a 2-day visit, providing income opportunities for at least 3 people, and financial support for some of the management activities of the ACP. Long-term financial sustainability without fostering dependence from outside actors is a challenge that we aim to tackle through this project. The medium-term goal is not to increase the amount of visitors, but to improve the quality of the services provided in order to increase fees and make the ACP financially sustainable for the community while minimally impacting wildlife.

TOWARDS THE IMPLEMENTATION OF NEW RIGHT-BASED MANAGEMENT FOR COASTAL INDIGENOUS COMMUNITIES IN CHILE

Luciano Hiriart-Bertrand, Costa Humboldt; Carlos I. Vargas, Costa Humboldt

Seeking to improve the granting of rights to coastal indigenous people in Chile, a novel regulation that provides a new regime to ensure their participation in marine biodiversity conservation and sustainable fisheries management initiatives was established in 2008. Marine and Coastal Areas for Indigenous Peoples (MCAIP) represents a novel human-centered instrument for scaling up marine biodiversity and cultural conservation. From mitigating human disruptions, modify unregulated

activities, restoring marine ecosystems, and recovering fishery stocks to the management and development of an integrated marine planning spatial model. Currently, over fifty areas are requested at varying stages of progress, representing above 52.000km2 of nearshore and open-ocean habitats. In essence, 95% of MCAIP requested were founded on rights-based fishery management principles. Contrary to the Fisheries and Aquaculture law, that excluded indigenous fishery rights under its regulation, MCAIP stated strong rights for marine resources centred on the basis of international agreements and recommendations. The access of indigenous peoples to fishing rights, on the other hand, represents a concern for non-indigenous fishers who have current access and rights to fisheries. The issues associated vary from the acceptance of new entrants, to generating a potential increase on fishing pressures and the consequent diminishment of resources. This paper aims to present Chile as a case study to explore the implementation of proper governance systems for marine resources upon which traditional coastal indigenous livelihoods depend.

TRANSLOCATED AND RESIDENT EASTERN BOX TURTLES IN NEW YORK: MOVEMENT PATTERNS AND HABITAT USE

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Urbanization has increased the need for many turtle species to be actively managed for conservation. Increased urbanization not only decreases the amount of suitable habitat available for these species, but also fragments existing habitat. Additionally, turtles are more likely to die or be injured from collisions with vehicles and are more likely to be relocated or removed from their habitat by concerned citizens or wildlife collectors. In some instances, turtles no longer wanted by owners, found in yards or on roads, or confiscated from the wildlife trade are brought to nature reserves in hopes that the turtles will be rehabilitated and released. However, in many cases, their health prevents them from being released or their provenance is unknown and they cannot be returned to the area they originally lived. In these cases, healthy turtles of unknown provenance are sometimes released to areas different than their habitat of origin (translocation). In a nature reserve with an existing population, how well do translocated turtles do? Do they use the same type of habitat as the turtles that already live there (residents) or the same amount of habitat? To address these questions, our research team studied the movement patterns, habitat use, overwintering behavior, and health of both resident and translocated Eastern Box Turtles (*Terrapene carolina carolina*) over four years at a nature reserve in Westchester County, New York, USA. Based on the results of this study, we provide recommendations for translocations, particularly for turtles of unknown provenance.

TRENDS IN ILLEGAL WILDLIFE TRADE: ANALYZING SEIZURE DATA IN THE PACIFIC NORTHWEST

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The illegal import of wildlife and wildlife products into the U.S. is a growing concern due to its far-reaching consequences and the growing evidence to support the fact that the U.S. is one of the world's top leaders in the consumption and transit of illegal wildlife and their derivatives. Yet, few studies have analyzed the illegal wildlife trade on a national or local scale. Therefore, this paper aims to contribute to the scholarly literature by analyzing wildlife seizures made at U.S. ports of entry in the Pacific Northwest between 1992 and 2016. Specifically, the following two questions are assessed: (1) How do the types of species seized compare across time and location and (2) How do personal baggage seizures compare with other types of seizures? This study finds that there is a significant different in the type of species across time and location and personal baggage seizures make up the majority of wildlife seizures in the Pacific Northwest. While wildlife seizures across taxonomic categories have decreased since 2008, other findings provide a reason for concern. Suggestions for the U.S. Fish and Wildlife Service of Law Enforcement Office are provided.

UK BIODIVERSITY CHANGE A STUDY OF 11000 SPECIES FROM 28 TAXONOMIC GROUPS

Charlie Outhwaite, Centre for Ecology & Hydrology/ University College London

National and global biodiversity targets exist with the aim of stopping the loss of biodiversity. In order to determine whether these targets have been reached, the change in the state of biodiversity must be measured. However, the monitoring and reporting of biodiversity change is primarily focused on well-studied taxa such as birds or butterflies. This focus is due to the availability of high-quality, standardised abundance data for these groups. Little attention is given to wider biodiversity such as invertebrates and plants. These groups perform different functions as part of our ecosystems than birds or butterflies. If surrogate groups such as birds are the major

measure of biodiversity change, this misrepresentation of wider biodiversity could be hiding a different picture of change in terms of ecosystem functioning. Understanding change of these wider groups is therefore key to understanding the provision and maintenance of ecosystem functioning. In the UK, biological recording by volunteers provides vast amounts of occurrence data for many taxonomic groups. In order to provide a broader overview of biodiversity change in the UK, occurrence data were collected from these sources for 11,000 UK species from 28 taxonomic groups and occupancy models used to estimate trends in species occurrence since 1970. This is the largest study of UK biodiversity change to date and highlights the variation in responses between and within taxonomic groups and by groups providing major ecosystem functions.

UNBALANCED PREDATION-NET IN THE TATAMA ZONE AND ITS INFLUENCED ZONE: IMMINENT WILDLIFE CONFLICT

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To plan the conservation management of the biodiversity we must to can to formulate specific and measurement goals that let us to assessment the effectively of the management. To formulate these goals over each component of the biodiversity is not practical and effective. Thus, we must to select some surrogate items that represent the conservation goals and their treats and causes. In this sense the West Andean Protected Areas Subsystem (WAPAS), as an initial step to review and fit its management plan, carried out the selection of those surrogate items call them Valores Objeto de Conservación (VOC). The selection was done using the Landscape Species Approach. They were were selected nine species: Andean bear (*Tremarctos ornatus*), cougar (*Puma concolor*), pacarana (*Dinomys branickii*), Colombian woolly monkey (*Lagothrix lugens*), Neotropical Otter (*Lontra longicaudis*), jaguar (*Panthera onca*), mountain tapir or woolly tapir (*Tapirus pinchaque*), West Indian manatee or sea cow (*Trichechus manatus*) and Andean Duck (*Oxyura ferruginea*). In order to can to use this landscape species like a model to adapt the management, they must to be monitoring effectively that can to let us detect changes. To monitor them, we chose the proportional area occupied estimated with occupancy model methodology and the relative abundance measurement with camera traps with out individual recognition (Rowcliffe method) as the indicator. We began the sampling in the Tatama National Natural Park zone. The sampling effort was of the 18 samplings point. We get 381 records of 27 species, 15 mammals and 12 species. The VOC recorded were the Andean bear and cougar. In general, we found a major abundance of big and middle carnivorous that preys. We think that sport hunting has reduced the middle preys that drive a conflict between carnivorous and cattle. We have recorded at least 20 events of predation of cougar over sheep that could be generate retaliate hunting. We have revised the action plan.

UNDERSTANDING AND QUANTIFYING THE POTENTIAL FOR LAND SPARING IN BRAZIL

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A central challenge for conservation science is to reconcile food production with the protection of species and their habitats. One promising way to do that is to concentrate food production on existing farmland while protecting and restoring natural habitats such as forests. However, for this 'land sparing' approach to be effective, a detailed understanding is needed not only of its biophysical potential, but also of the social, economic and political conditions that could enable it to happen. We present a detailed spatial analysis of the potential for land sparing across the different biomes of Brazil, emphasizing opportunities to increase the productivity of cattle ranching and prevent further pasture expansion. We map a range of social, economic and governance-related variables which create challenges and opportunities for linking yield increases with the protection and restoration of natural habitats. With sufficient political will, conservation and agricultural policies can be adapted and integrated to encourage land sparing, but care is needed to avoid unintended consequences.

UNDERSTANDING DISEASE TO PROTECT GALAPAGOS ENDEMIC AVIFAUNA

Maricruz Jaramillo, University of Missouri - Saint Louis; Patricia Parker, University of Missouri St.Louis, Wildcare Institute Saint Louis Zoo; Sage Rohrer, University of Missouri - Saint Louis

A large number of emergent infectious diseases witnessed in the past few decades has increased interest in the

ecology and distribution of potentially threatening pathogens worldwide. Island species are often considered more vulnerable to parasites due to their impoverished parasite communities and long isolation from disease. Avian surveys done by our group on the Galapagos Islands have found various pathogens infecting the endemic avifauna, including the haemosporidian genera Plasmodium and Haemoproteus. Repeated findings of a Plasmodium sp., denominated lineage A, suggested that the parasite has established; however, there is no evidence that the parasite is able to complete its life cycle in any of the endemic birds. Thus, we investigated the role that exotic birds in Galapagos play in disease transmission to allow us to identify agents and/or hotspots of transmission, which could provide managers with a timely opportunity to prevent major losses of Galapagos avifauna. On the other hand, *Haemoproteus (Haemoproteus) multipigmentatus*, a presumably introduced parasite thought to be unique to Columbiformes and highly prevalent in Galapagos doves (*Zenaida galapagoensis*) has been found in several passerine bird species on Santiago Island. Again, the endemic hosts do not appear to be competent hosts but these spillover events could have implications for virulence in these non-competent bird hosts. The endemic Galapagos dove acts as a reservoir host for the introduced parasite; however, the effect of this parasite on passerines remains to be studied. Investigating the dynamics of the parasites and their avian hosts in the Galapagos Islands provides an opportunity to determine whether this isolated island avifauna is indeed more vulnerable to disease and currently at risk. The Galapagos archipelago is peculiar in that its avifauna remains largely intact and efforts to conserve it have a great potential for success.

UNDERSTANDING THE DYNAMIC NATURE OF HOST-ASSOCIATED MICROBIAL COMMUNITIES FOR PROBIOTIC DEVELOPMENT

Angie Estrada, Virginia Tech; Matthew Becker, Virginia Tech; Lisa Belden, Virginia Tech; Reid Harris, James Madison University; Myra Hughey, Virginia Tech; Roberto Ibáñez, Smithsonian Tropical Research Institute; Daniel Medina, Virginia Tech; Eria Rebollar, James Madison University; Jenifer Walke, Virginia Tech

Beneficial skin bacteria can protect amphibians against chytridiomycosis, a deadly infectious disease caused by the fungus *Batrachochytrium dendrobatidis* (Bd). Bd has been linked to amphibian population declines and species extinctions worldwide in recent decades. Probiotic therapies, where amphibians are treated with beneficial bacteria, are considered as a potential solution for re-introducing Bd sensitive amphibians to environments with endemic Bd. However, host-associated microbial communities can be dynamic. Understanding temporal variation of bacterial communities on amphibian skin is therefore critical for establishing baselines from which to improve the development of mitigation techniques based on probiotic therapy and provide long-term host protection in a changing environment. Here, we investigated how microbial communities on amphibian skin change across years and between seasons by collecting skin swabs from two pond-breeding species of Panamanian treefrogs (*Agalychnis callidryas* and *Dendropsophus ebraccatus*) for four years in a single lowland tropical pond. Relative abundance of bacterial OTUs (operational taxonomic units, ~bacterial species) based on 16S rRNA gene amplicon sequencing was used to assess skin bacterial community diversity. We found variation between the two species within the same pond. In addition, we found significant variation in bacterial community structure across years for both species, but this was stronger in *A. callidryas.* We also found significant changes across seasons in *D. ebraccatus*. Lowland amphibian species persist despite the presence of Bd and these preliminary findings suggest that skin-associated microbiomes vary across time, but future research needs to address whether these changes in bacterial structure result in changes in community function.

UNMANNED AERIAL VEHICLES UAV FOR SURVEYING RIVER DOLPHINS IN THE AMAZON

Marcelo Costa, WWF Brasil; Andre Coelho, IDSM; Daiane da Rosa, IDSM; Miriam Marmontel, IDSM

River dolphins are among the mammals most susceptible to threats in the world. In the Brazilian Amazon, river dolphins have been threatened by infrastructure projects, illegal harvesting and incidental captures in fishing nets. Even though, there is a scarce understanding about two species occurring in Brazil, *Inia geoffrensis* and *Sotalia fluviatilis*, undermining the designing of sound conservation plans. It is common sense that estimation of population abundance is critical to understanding the status of these two species, classified as "Data Deficient" by the IUCN. Our study aimed at evaluating the effectiveness of unmanned aerial vehicles (UAV) to optimize data collection in population studies of river dolphins. We tested the potential for detection and accuracy of dolphin images captured using drones in real conditions. Two quadcopter drones (DJI Phantom 3 and 4) were launched from a double-decker riverboat navigating at 10 km/h, in an average distance of 50m parallel to the river margin. Four flights per hour were held from 6 am to 6 pm in a fixed 20 m altitude, 10´ duration and 35o camera angle study design. The experiment was conducted

simultaneously with a traditional monitoring expedition, making possible comparisons among the two methods. Along 400km of the Jurua river, in the Amazonas state, 80 km of transects were sampled by drones, totaling eight hours of videos recorded. River dolphins were clearly detected in a range of 100m from the drone, being possible to distinguish animals from the two species. Little variations considering the river turbulence, glare or water visibility were observed. However, strong winds made it hard to land the drones. Preliminary results have shown this technology has great potential to support population studies on river dolphins, requiring improvements on the range of detection, flight duration, and development of an algorithm to provide animals automated detection.

USING BIOGEOGRAPHY TO IDENTIFY CRYPTIC DIVERSITY AND BLACK HOLES IN BIODIVERSITY SAMPLING

Kyle Shaney, University of Texas, Arlington

The Indonesian archipelago is one of the most bio-diverse regions in the world; however, scientists are yet to fully understand the biogeographic relationships among many of the islands' diverse taxonomic groups. Examining those relationships is essential for uncovering new species and may also yield insight into where to target future surveys; particularly at a time when tropical forests are rapidly being eroded by human pressures. We conducted amphibian and reptile inventories across the montane cloud forests of Java and Sumatra, Indonesia, systematically targeting mountain ranges based on isolation by distance and elevation. We used an integrative taxonomic approach, including morphological characters and next generation sequencing techniques, to compare the relationships between highland agamid lizards collected during our surveys. We uncovered widespread cryptic diversity between montane sky island populations, which are distributed allopatrically, in a point endemic arrangement across the landscape. A topographic prominence occurring at 1,000 meters or below (between mountain tops) indicates where breaks in new species distributions are most likely to occur. Using these biogeographic patterns, we identified several other mountain ranges which are yet to be surveyed for reptile and amphibian diversity in Sumatra and we suggest those may be "black holes" in biodiversity sampling. These methods can be applied to complex biogeographic regions with high biodiversity throughout the world, and are particularly relevant for other bio-diverse groups lacking thorough taxonomic assessment.

USING DESIGN PRINCIPLES AND CUSTOMER DEVELOPMENT FOR SCALABLE CONSERVATION SOLUTIONS

Cassie Hoffman, Conservation X Labs

Human behavior and consumption drive many of today's conservation challenges. Conservationists increasingly look to technology-enabled solutions and innovation to improve the means by which we meet food and material needs, monitor environmental change, and improve the transparency of governance and efficacy of law enforcement in order to conserve biodiversity and maintain the integrity of ecosystems. Effective and scalable conservation solutions, and specifically applied technologies, will incorporate human-centered design principles and give careful attention to the incentives, motivations, and constraints of the end-user, who may not always be a university-educated conservationist. Scaling solutions requires consistent implementation and sound process management, but this end-user, customer-focus ensures the sustainability, usability, and ultimately, the adoption of any new technology. Businesses conduct rigorous customer and market testing before producing a product, and conservationists have the opportunity to learn from this practice while maintaining and incorporating other important elements of conservation planning and stakeholder consultation. Conservation X Labs is developing a new conservation technology, the DNA barcode scanner. The DNA barcode scanner will be a handheld and portable device with the ability to differentiate, and potentially ID species, within an hour at a reasonable cost-point ($10-$20 per test). The device is being designed for the developing world and has many applications in combatting timber and wildlife trafficking as well as traceability in the field. We share our experience, methodology, and lessons-learned in applying human-centered design principles and customer development and discuss how this methodology can be applied to the field of conservation technology to make such solutions more scalable.

USING EGGSHELLS TO HELP WITH CRYPTIC SPECIES MANAGEMENT

David Vieco, Massey University

Kiwi (at least five species in the genus Apteryx) are very unique group of bird endemic to New Zealand possessing a very different biology than other ratites, being nocturnal, insectivorous, extremely precocial and have one of the biggest eggs in proportion to the body of the bird and are the sole ratite that builds a proper nest. Habitat loss and introduced mammalian predators have decimated natural populations over the past 200

years and great effort has been made to stabilize these populations trough a number of programmes aimed to increase populations and distribution. It was just recently accepted that there were three species of kiwi; however, the recently discovered taxonomic diversity (including several cryptic taxa) poses new challenges for Apteryx conservation. Genetic taxonomy needs to be supported by anatomical, behavioural and physiological differences between species, Egg shell structure and composition has been used as a means to differentiate between taxa. Additionally, these eggshell characteristics can also reflect ecological adaptations and resource availability at the time of egg formation. Our project examined the structure and composition of the eggshells of four Apteryx species and found important differences in the physical structure between species. Total thickness, thickness of each structural layer and pore size, shape and density can be correlated with environmental needs for a successful breeding. We have found that Brown Kiwi, Great spotted kiwi, Tokoeka and Rowi have very different pore shapes and sizes. The analysis of the chemical composition of the shells is ongoing. However, initial results show unusual amounts of elements such as iron and nickel that could be related to functional proteins that would protect the egg against the elements. The results so far support the classification of these groups as separate species and therefore their management as separate conservation units.

WATER AND THE CONSERVATION OF WIDE-RANGING FOREST RED-TAILED BLACK-COCKATOOS IN A DRYING CLIMATE

Michael Craig, University of Western Australia; Richard Hobbs, University of Western Australia; Tony Kirkby, Weatern Australian Museum; Michael Renton, University of Western Australia; Vicki Stokes, Alcoa of Australia

Many wide-ranging species are threatened with extinction. This is partly because they typically range over large areas and so cannot be effectively conserved solely by zoning parts of the landscape for conservation where competing land uses are excluded. While conservation, across the landscape, of the functional habitat features these species require is one method to enhance their conservation, how these features interact to determine patterns of landscape use is poorly understood. One obvious feature that could potentially restrict the use of other features is water, particularly for those species that need to drink regularly. To determine if water restricted the locations of Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) nests, we examined the spatial locations of nests in three landscapes in the northern Jarrah (*Eucalyptus marginata*) forest of southwestern Australia and compared them to random hollow-bearing trees. At the landscape level, nests were no closer to tracks, watercourses, or granite outcrops than random hollow-bearing trees, but they were closer to drink sites, both temporary and permanent, although there was some variation between landscapes. Cockatoos, which need to drink daily, likely locate their nests close to suitable drink sites to ensure access to a regular supply of water during the nesting period. These results have obvious implications for the conservation of wide-ranging species that require water. Conserving these species through retention of the functional habitat features they require will only be effective if it takes into account how these features are located relative to suitable drink sites. Fortunately, water can be provided as a relatively cheap management tool for some species, and this may help conserve populations of some wide-ranging species under a drying climate.

WHAT CAN REMOTE SENSING DO FOR THE CONSERVATION OF VERNAL POOLS ON DOANAS AEOLIAN SANDS?

Javier Bustamante, Estacion Biol Donana, CSIC; Isabel Afán, Estación Biológica de Doñana, CSIC; David Aragonés, Estación Biológica de Doñana, CSIC

Doñana's aeolian sands hold one of the better-preserved systems in Europe of small vernal pools, of importance for biodiversity conservation. These sands sands have received different levels of environmental protection influencing the degree of conservation and the flooding dynamic of these pools. We use satellite images of the Landsat series from 1985 to 2016 to study the temporal flooding dynamic of vernal pools in relation to the protection level and to distance to water abstraction pressures. Our results prove that a medium resolution time-series like that provided by the Landsat satellites is an effective way to study the flooding dynamic of this system. The areas that have received a higher level of environmental protection have a better-preserved system of vernal pools, with a flooding dynamic that fluctuates with precipitation. Unprotected areas show an increase in artificialization in flooding dynamics, with an increase in hydroperiod duration, and surface flooded, and a decline in hydroperiod variability. This is due to the creation of new artificial irrigation ponds and to changes in the flooding regime of the natural pools, that either receive the excess of irrigation water or dry-up due to the groundwater abstraction. Although a decline in hydroperiod duration of vernal pools can be seen as negative to the system, an increase in hydroperiod of surface waters due to artificialization, or a decline in variability cannot be considered as positive compensatory effects.

WHAT SAVED COSTA RICAS FORESTS? AN ANALYSIS OF REFORESTATION DRIVERS 1950-2015

Esteban Rossi, Universidad Javeriana and Research fellow Breakthrough Institute

In Costa Rica it has been observed that reforestation (forest regrowth) has exceeded deforestation for over a decade. Although interpreting recent changes in land use and land cover (LULC) at the national scale remains challenging and forest cover estimates differ, Costa Rica could be one of the first tropical countries to experience a forest transition as previously described by Alexander Mather in industrialized countries. While the characterization of changes in LULC has improved rapidly due to advances in remote sensing, the characterization of the socioeconomic drivers of reforestation has received less attention partly because their effects become evident many years later. This study offers a historic analysis of the role of domestic policies and international market forces in shaping Costa Rica's ongoing forest transition. To this end it builds on a detailed review of scientific literature and government reports complemented with interviews with Costa Rican scientists and policy makers. Results suggest that international economic crisis forced major changes in Costa Rican agricultural and development policies that later facilitated forest regrowth. Foreign market forces also precipitated the collapse of the cattle industry, which was perhaps the largest deforestation driver between the 1960s and 1990s. In hindsight, environmental policies, including protected areas and payments for ecosystem services, facilitated reforestation but were less important than market forces. Presently, environmental policies are essential to maintain current forest extent. Arguably, the remarkable feature of the Costa Rican experience was the way in which government policies adjusted to changing international markets. Lastly, we highlight some potential lessons for other developing countries.

WILDLABS.NET: NETWORKING ON CONSERVATION TECHNOLOGIES TO ENHANCE CONSERVATION OUTCOMES

Stephanie O'Donnell, Fauna & Flora International

Today, technology is helping conservationists to research, adapt and apply existing tools that transform our understanding of the natural world and enhance our ability to mitigate threats like the illegal trade in wildlife. However, integrating technology requires resources, training and testing on the ground in challenging conditions. Currently, data and lessons learned from research, development and field applications often remain within major conservation organizations, universities, as well as private and public institutions and are not shared widely enough. WILDLABS.NET is working to break down these silos. United for Wildlife, with support from Google.org and ARM, launched WILDLABS.NET to enable more open sharing of information about the use of technology for conservation. It brings together a community of conservationists, technologists, engineers, entrepreneurs and thought leaders to share problems and successes, give and receive guidance, and access the resources needed to discover or collaboratively create technology to solve big conservation challenges. Launched in Nov, 2015, the WILDLABS.NET community has grown rapidly to over 1300 global members. Members have been sharing ideas on a range of topics including new predator deterrents, using seismic detection technology to prevent human-wildlife conflict, and tackling illegal logging with technology. They are collaboratively developing new hardware prototypes, including a new open-source acoustic monitoring device for tracking wolves and an automatic elephant detector using machine learning. They have also been crowd-sourcing answers to questions about low-cost tracking tags, integrating wildlife tracking with other technologies, self-powered camera traps, all the while sharing conservation tech news and projects. ICCB 2017 offers a timely opportunity to share 18 months of WILDLABS.NET. The talk will outline initial results and highlight case studies of community developed or implemented technology.

WORKING WITH LOCAL PEOPLE TO CREATE A NEW PROTECTED AREA IN THE SIERRA DE FAMATINA, ARGENTINA

Lucila Castro, National University of Cordoba; Peter Morrison, Pacific Biodiversity Institute

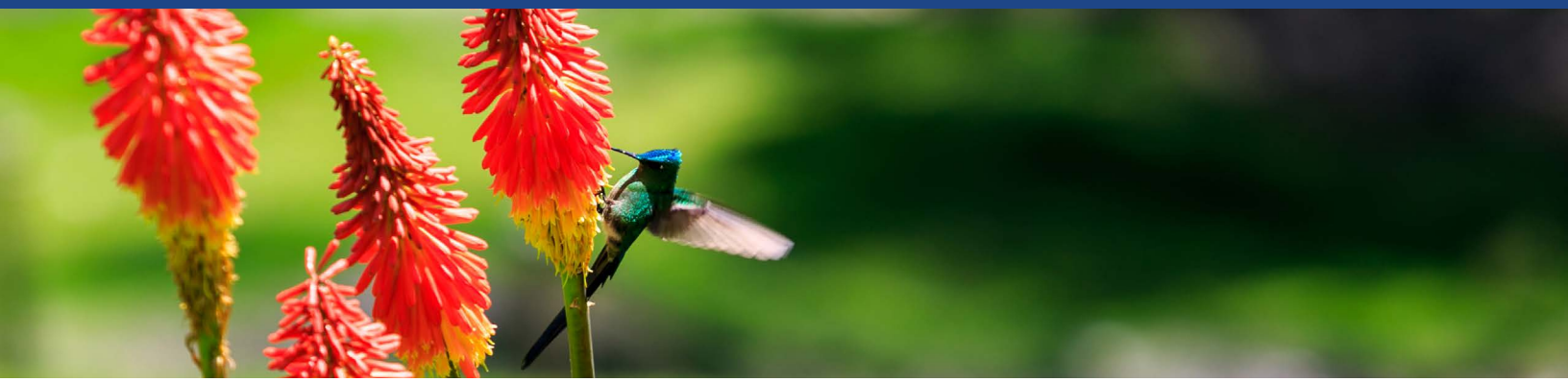
The Sierra de Famatina, in La Rioja province, west Argentina, is threatened by large global mining corporations that want access to the gold deposits in the mountains. The local people living at the base of the mountains have been waging a very brave and successful battle to protect the mountains from the mining companies for over 10 years. Pacific Biodiversity Institute started exploring the Sierra de Famatina in 2008 and quickly realized that this mountain range and its vast biodiversity is a world-class treasure. Our work began with exploration, mapping and description of the area, and documentation through photography and videography. We developed extensive information on the plants, animals, ecosystems, human uses and threats to these mountains and summarized this information in a report. This report contains information collected from published literature, from locals and from our own research expeditions. We assessed the area from the perspective of irreplaceability and vulnerability. What is its overall

contribution to global biodiversity, what would be lost if this biodiversity is diminished disappear and what threats does the area face? Our goal is to work with local people to develop a long-term strategy for protection of this immense mountain range. This project has 3 approaches: working with local people, working with other NGOs and politicians to develop a political initiative, and field work to continue collecting information. We have had numerous meetings and workshops with locals to discuss options for protection and to make decisions over the last 2 years. We had several meetings with scientists, with NGOs and universities to get their support. We are now working with the Argentine National Park Service to determine land ownership and boundaries for a new national park. This project shows how important the role of local communities in collaboration with conservation biologists can be in the protection of high biodiversity wildlands.

ZOONOSIS IN DOMESTIC DOGS AS A THREAT FOR WILD ANIMALS IN BRAZIL

Anaiá Sevá, University of São Paulo; Ana Pérola Brandão, University of São Paulo; Fernando Ferreira, University of São Paulo; Silvia Godoy, Instituto Chico Mendes; Jonas Moraes Filho, University of São Paulo; Amanda Sousa, University of São Paulo; Camila Vieira, University of São Paulo

The expansion of urban areas approaches man and domestic animals to the wild environment. As a result, the interaction and transmission of pathogens among these species increases, generating implications for public health and environmental conservation, since some infectious diseases in wild animals can cause their extinction. This scenario has been occurring in several protected areas around the world, such as Conservation Unit Carlos Botelho State Park (CBSP) in Brazil. Discovery and monitoring of pathogens are extremely important to strengthen prevention and control policies of emerging infectious diseases. We conduct a serological investigation of some zoonosis in domiciled and semi-domiciled domestic dogs which lives in the CBSP's surroundings. In two censuses carried out in the years of 2015 and 2016, 350 and 396 dogs respectively were sampled, of which 252 were sampled in both years. In 2015 and 2016 80% and 86% of the animals respectively, were reactive for at least one of the five species of rickettsiosis (*Rickettsia rickettsia, R. parkeri, R. amblyommii, R. bellii*, and *R. rhipicephali*), being 242 positives in both years. For leptospirosis, 10% in 2015 and 6% in 2016 of the dogs were positive, being six of them positive in both years. Of the 13 serovars tested the most presents were *Cynopteri Cynopteri* (55%), *Autumnalis Butembo* (15%), and *Grippotyphosa Grippotyphosa* (9%). For Brucella abortus only one dog was positive in 2015. These high prevalences can generate a strong impact in wild animals of the CBSP, once they are exposed to the agents and can become infected. Prevention and control measures related to these diseases encountered need to be performed in the study area, such as population control and immunization of domestic dogs (mostly to prevent leptospirosis), and also health and animal welfare education. These actions will be developed in our project, in order to contribute to the improvement of environmental, animal and human health in that area.



"CRIME SCRIPT" FOR THE ILLEGAL WILDLIFE TRADE OF PERU

Antony Leberatto, New Jersey City University

The "crime script" framework (Cornish 1994) can aid in the description of offender decision making throughout the crime commission process across a variety of offense types (ranging from simple street crimes to multinational organized crimes). This investigation utilizes the "crime script" framework to analyze the illegal wildlife trade processes across Peru, one of the world's mega-diverse nations. An exhaustive five-year long field investigation; formal interviews (n=85) with hunters, middlepersons, intermediaries, sellers, buyers, conservationists, fauna rescuers, and ecological police; and participant observations across 50 cities help to create this illegal wildlife trade crime script. Importantly, a description of the stages before, during, and after the trade of protected wildlife can help us formulate where and how to intervene in order to prevent these offenses from reoccurring in the future.

A BUSINESS CASE FOR CORAL REEF CONSERVATION

Kenneth Anthony, Australian Institute of Marine Science

The global decline of coral reefs under climate change is more than a conservation issue. It represents a threat to economies and livelihoods, and to food security in developing countries. Coral reefs feed over 100 million people. The global net present value of coral reefs is estimated at US$ 900 billion per year if only fisheries and tourism are counted, and nearly US$10 trillion per year if coastal protection is also included. This places coral reefs on par with the world's largest companies in terms of revenue and capital. Here we present the idea that reef decline can be slowed or halted by shifting conservation toward a business leadership-type approach. We show that a community-trust model with different mechanisms of impact financing, use rights, and avenues for equitable returns on investments can turn the tragedy-of-the-commons situation for many coral reefs into a model of growth.

A CASE STUDY OF INCREASING DIVERSITY IN THE AMERICAN ELASMOBRANCH SOCIETY

David Shiffman, Simon Fraser University

Low diversity in science and conservation is a well-documented problem. This issue is less well studied at the sub-disciplinary level, and both the degree of lack of diversity and associated possible solutions may vary widely between subdisciplines. Here, I will focus on a case study among shark researchers. The American Elasmobranch Society, the world's oldest and largest professional society focusing on the scientific study and management of sharks and rays, instituted a new program in 2015 to attempt to increase the diversity of our membership. The Young Professional Recruitment Fund (YPRF) sponsors the membership costs of student and early career elasmobranch researchers from historically underrepresented minority groups, and provides them with specialized mentorship, networking, and professional development training. Now in its second year, this program has brought 41 early career researchers from underrepresented backgrounds into the Society. This talk will discuss Society demographics before and after the YPRF program, explain how the program is run, and present survey results from the 1st class of YPRF diversity scholars. Future plans for the YPRF program will be discussed. It is our hope that this model can be useful for efforts to increase diversity in other sub-disciplines within marine science.

A CONTINENTAL CHALLENGE: ASSESSMENT OF TROPICAL AND TEMPERATE FOREST DECLINE IN THE AMERICAS

José Ferrer Paris, Ivic; Mario González-Gil, Provita; Jon Paul Rodriguez, Instituto Venezolano De Investigaciones Científicas; Irene Zager, Provita

The forests of the Americas are undergoing rapid change as human populations increase and land use intensifies.

A continental perspective on forests most at risk is urgently needed to support planning and investment in conservation. The International Union for the Conservation of Nature (IUCN) Red List of Ecosystems provides a standardized means to evaluate the state of natural ecosystems in a changing world. Here we approach a first continental assessment of the America's tropical and temperate forests based on proposed hierarchical units of analysis and available land cover layers. Specifically, we evaluated 138 vegetation Macrogroups from five tropical and three temperate forest formations proposed by the International Vegetation Classification. We first validated their spatial distribution with data on biogeographical units, environmental strata, distribution of characteristic species, and overlap with similar macrogroups. For 113 macrogroups with valid spatial data, we assessed spatial Red List of Ecosystems criteria A and B. Historical and contemporary changes in spatial distribution were estimated from different available sources. Uncertainty in the assessments due to alternative sources of data or methods was summarized. More than 60% of the assessed Macrogroups were found to be threatened due to historic rates of decline, and more than 15% continue to suffer threatening declines. The estimated severity of these declines varies with different data or methods, but the most pessimistic scenario suggests that 48 macrogroups are Critically Endangered, 25 Endangered and 12 Vulnerable. Warm Temperate Forests and Woodlands, and Tropical Dry Forests are more severely threatened than other formations. We found that the continental status of a macrogroup is not always representative of the status at a national scale and continental analysis needs to be complemented with more detailed national assessments.

A DIGITAL OBSERVATORY FOR PROTECTED AREAS (DOPA) TO SUPPORT DECISION AND POLICY MAKING

Grégoire Dubois, Joint Research Centre of the European Commission

The Digital Observatory for Protected Areas (DOPA, http://dopa.jrc.ec.europa.eu/) has been developed to support the European Union's efforts in strengthening our capacity to mobilize and use biodiversity data so that they are readily accessible to policymakers, managers, experts and other users. Assessing protected areas for biodiversity conservation at national, regional and international scale implies that methods and tools are in place to evaluate physical characteristics such as the protected areas' proximity to one another, their species assemblages (including the presence of threatened species), the uniqueness of their ecosystems, and the threats these areas are exposed to. Typical requirements for such analyses are data on protected areas, information on species distributions, abundance and status on the IUCN Red List of Threatened Species, and information on ecosystems which allows us to assess their irreplaceability and monitor changes. Recognized by the UN Convention on Biological Diversity (CBD) as a reference information system, the DOPA, by integrating all these data consistently in the form of metrics and indicators, is one of the very few services available online that is allowing end-users to evaluate protected areas individually but also to contrast each protected area against each other for setting conservation priorities. We present here DOPA Explorer 2.0 which is assessing all protected areas in the world as large as 50 km2 (~20 000 protected areas) by means of a set of indicators summarizing the uniqueness of their habitats and species (currently computed for three taxa) as well as the pressures they are exposed to. The higher the values of these indicators, the higher the ranking of the protected area in any potential prioritization scheme. We further discuss the use of such information to improve decision-making as well as the new developments required to circumvent the known limitations when using global datasets for local assessments.

A FIELD EXPERIMENT TESTING INTERVENTIONS TO PROMOTE CONSERVATION PRACTICES ON RENTED CROPLANDS

Chloe Wardropper, Purdue University, The Nature Conservancy; Sheila Walsh Reddy, The Nature Conservancy; Randy Dell, The Nature Conservancy; Francis Eanes, Purdue University; David Harlan, David Harlan; Yuta Masuda, The Nature Conservancy; Linda Prokopy, Purdue University; Pranay Ranjan, Purdue University

The majority (>60%) of US farmland in critical areas for agriculture and conservation (e.g., the Corn Belt) is rented. On these lands, the owner is not the operator (i.e., the farmer). This is an issue for soil health and water quality because the odds that a tenant farmer adopts conservation practices (e.g., cover crops, reduced tillage, and optimal fertilizer management) is much lower than for a farmer who owns the land. We hypothesize that adoption rates on rented croplands are low because of four barriers: 1) lease terms that create uncertainty and disincentives for conservation, 2) lack of involvement of landowners in decisions due to habit or social issues, 3) lack of information targeted to non-operator landowners, especially women, and 4) uncertainty of costs and benefits. This study fills a major gap in our understanding of how arrangements between non-operator landowners and tenant farmers create barriers to adoption of conservation practices on rented croplands in the US Corn Belt and how to overcome these barriers. To fill this gap, we: 1)

conducted qualitative research to characterize decision-making processes and barriers related to conservation practices on rented croplands, and are 2) implementing a large randomized controlled trial to test interventions (e.g., information, legal assistance, financial incentives, prosocial/pro-environmental messaging) targeting landowners and barriers to adoption on rented croplands. The study results will provide a robust, empirical evidence base for strategies to engage non-operator landowners. Specifically, it will inform a landowner strategy at The Nature Conservancy. It may also provide insights for new government outreach programs and for companies seeking to provide better services to landowners. Together, these impacts could help transform soil health and water quality by identifying ways to promote conservation practices on rented croplands.

A GLOBAL MITIGATION HIERARCHY FOR NATURE CONSERVATION

William Arlidge, University of Oxford; Prue Addison, University of Oxford; Joseph Bull, University of Copenhagen - KU; Michael Burgass, Imperial College London; Dimas Gianuca, University of Exeter; Taylor Gorham, Marine Stewardship Council; Taylor Gorham, Marine Stewardship Council; Sam Lloyd, Imperial; E.J. Milner-Gulland, University of Oxford; Nicole Shumway, The University of Queensland; James Watson, Wildlife Conservation Society; Chris Wilcox, Csiro Marine and Atmospheric

Maintaining sustainable natural systems whilst carrying out economic development activities is amongst the greatest challenges facing contemporary human society. We propose applying the mitigation hierarchy for development with the associated objective of 'no net loss', to achieve global conservation of biodiversity. This would allow systematic accounting of all gains and losses of biodiversity, in turn guiding consideration of uncertainties, counterfactual trends, and ecosystem dynamics across multiple scales. We demonstrate how existing conservation principles and interventions can be integrated within such a hierarchy, providing a coherent framing to clarify the ultimate aim of biodiversity conservation, and how it can be achieved.

A NEW METHODOLOGY FOR FRESHWATER COMPENSATION IN COLOMBIA

Tomas Walschburger, The Nature Conservancy; Juliana Delgado, The Nature Conservancy; Felipe Osorio, Independent; Carlos Rogéliz, The Nature Conservancy

Compensation schemes are implemented in different countries, mobilizing important funding to improve biodiversity conservation. According to Mitigation Hierarchy after avoiding and minimizing the environmental impacts, the residual ones have to be compensated. Colombia approved a new compensation manual for terrestrial biodiversity loss in 2013. Freshwater and marine components are still to be included as an integrated scheme. This talk presents a proposal for addressing this gap based on the following general principles: no net biodiversity loss, ecosystem equivalence, privilege conservation over restoration, contribution to the implementation of conservation portfolios, duration and permanence, thresholds and cumulative impacts. The logical scheme includes: identification and quantification of impacts (what and how much), identification of possible areas (where) and activities to compensate (how). The compensation scheme accounts both for impacts on seasonally flooded ecosystems and lotic and lentic ecosystems, and its being developed with the Ministry of Environment. Impacts on freshwater ecosystems are measured based on flow regime alteration, loss in longitudinal and lateral connectivity, changes in biotic composition and direct habitat loss. For each type of impact, a detailed step by step procedure was developed that quantify direct ecosystem area impacted and downstream length with flow alteration. To avoid loss and achieve biodiversity gains, two criteria are used to define the total area and stream length to be compensated: biological importance (based on ecosystem rarity, representation in protected areas, presence of sensitive species and value for fisheries) and system condition. Potential compensation sites must meet at least following conditions: be located in the same hierarchical basin system, same type of system and coincide with priority areas defined in planning instruments.

A NEW PLACE FOR STORIES: OBLIGATIONS AND OPPORTUNITIES FOR STORYTELLING IN CONSERVATION

Alex McInturff, UC Berkeley

In his foundational article "What is Conservation Biology?", Michael Soule writes "In crisis disciplines, one must act before knowing all the facts; crisis disciplines are thus a mixture of science and art, and their pursuit requires intuition as well as information." Since this article was published three decades ago, conservation biology has largely focused its energies on formalizing and memorializing its scientific findings. There is no doubt this empirical turn has developed vital methods and tools, enabled links between science and policy, and fortified the discipline's credibility within the broader biological sciences. Nevertheless, Soule's intuition that conservation biology requires a kinship with art, and particularly with storytelling, has persisted beneath the surface of the

discipline in at least three important ways. First, as a crisis discipline, conservation biology remains firmly attached to questions not just of valuation but of value, which have always relied on stories and myth for expression and enrichment. Second, conservationists continue find that stories are at least as effective as logic in communicating results and precipitating action. Fortunately, conservation science lends itself to narrative arcs by demonstrating evidence of change. Revelations of the degradation and restoration of biological diversity rhyme with myths of loss and redemption, and create important roles for storytelling in conservation projects. Third, as the conservation tent continues to expand beyond just understanding what humans have done to understanding why, there is an increasingly pressing need for listening to the stories that accompany human behavior. Conservation continues to thrive as an empirical discipline. As our speakers will share, embracing the opportunities and obligations of storytelling will allow conservation to engage even more deeply with a complex world and to take on more compassionate and comprehensive challenges.

A QUANTITATIVE WORLDWIDE ASSESSMENT OF BIODIVERSITY OFFSETTING

E.J. Milner-Gulland, University of Oxford; Sam Lloyd, University of Oxford; Niels Strange, University of Copenhagen

Economic development benefits society, but negatively impacts nature. "No Net Loss" (NNL) policies could help balance development and nature conservation. Under NNL, project developers – having first estimated the likely biodiversity impacts, and mitigated them where possible – quantifiably offset all losses through conservation gains elsewhere. In theory, this results in NNL overall – dissociating biodiversity loss from development. But there have been no quantitative assessments of the actual outcomes of NNL policy implementation beyond the regional or national scale. We address this gap by assessing the worldwide implementation of the most controversial aspect of NNL, biodiversity offsets. We compiled a database of 13,194 biodiversity offsets globally, occupying > 134,000 ± 36,000 km2. Offsets have expanded as rapidly as the modern protected area network originally did in the late 1800s. Location data were available for 2,425 offsets: primarily within forest biomes, near urban areas, and outside of protected areas. In the US, NNL policy has been contemporaneous with a dissociation between economic growth and wetland loss. However, monitoring data for biodiversity offsets are highly non-transparent, so uncertainty around implementation remains a key challenge for understanding the outcome of NNL policies. 'Multipliers' – factors by which conservation gains are designed to be larger than losses so as to guarantee NNL – are one means for managing uncertainties in biodiversity offsetting. Multipliers in the hundreds cound be necessitated by socio-ecological uncertainties. Yet we found that multipliers are regularly <10.0 in practice. So, biodiversity offsets have been implemented more widely than was perhaps previously realized, but substantial gaps remain in terms of monitoring and evaluating the outcomes of NNL policies. Nonetheless, our first global assessment of biodiversity offsets suggests that NNL policies could feasibly enhance worldwide conservation efforts.

A RIGHTS-BASED APPROACH TO COLLABORATING WITH INDIGENOUS PEOPLE IN BOLIVIA, ECUADOR AND PERU

Robert Wallace, Wildlife Conservation Society; Zulema Lehm, Wildlife Conservation Society

From 1990 in Peru and 2000 in Bolivia and Ecuador, the Wildlife Conservation Society (WCS) has worked with riverine communities and Indigenous People towards the conservation of the Amazon. These rights-based experiences have recently been systematized, highlighting lessons learned. Firstly, the recognition of land and territory rights represents a basic condition for communities and Indigenous People to successfully develop conservation practices, which are only possible through a parallel recognition of their direct relationship with biodiversity through diversified uses that contribute fundamentally towards their livelihoods and culture. A second crucial lesson learned from our rights-based approach is a recognition of the right of self-determination of peoples: the restitution of the control of Indigenous People over their own destiny. In terms of a relationship with WCS, this implies a mutual recognition as equal partners and the right to free, prior and informed consultation which is strictly binding. This principle guides partnership actions encouraging respect for and engagement with organic decision-making structures. Within this framework, scientific research focuses on how biodiversity is linked to different community uses and should be participative, interdisciplinary, reliable, opportune and respond to the management needs of communities and Indigenous People. Thus, a right-based approach also requires considerable researcher communication abilities. Temporary, manipulative and authoritative relationships that treat Indigenous Peoples as passive recipients should be avoided at all costs in a right-based approach, as they exclude longer term, ethical and equal partnerships that are necessary for conservation work.

A SES APPROACH TO COMMUNITY-BASED RETICULATED GIRAFFE CONSERVATION IN NORTHERN KENYA

David O'Connor, San Diego Zoo Institute for Conservation Research & Senckenberg Bik-F & Goethe U

Reticulated giraffe (*Giraffa reticulata*) populations have declined by an estimated 70% since the 1990s (Muller et al., 2016). Endemic to north Kenya, and parts of Ethiopia and Somalia, the vast majority of remaining range of this species is on pastoralist community lands, co-existing with livestock and people. Given this context, conservation success and sustainability depend upon giraffe being tolerated and not being exploited on these lands. As such we are taking a social-ecological research approach to inform community-based giraffe conservation interventions in these areas. This talk summarizes the SES research approaches and outcomes to date from this SES project underway since 2016 at two sites in pastoralist northern Kenya with a team of eight community members.

A SPATIO-TEMPORAL ANALYSIS OF ALBATROSSES' EXPOSURE TO ILLEGAL LONG-LINING HOOKS IN THE CCSBT

Ronald Clarke, Rutgers University; Gohar Petrossian, Rutgers University, School of Criminal Justice

It is assumed that albatrosses will be most at risk in areas where their foraging sites overlap with areas with high illegal long-line fishing activity. This is because their "activity space" (Brantingham & Brantingham 1993) intersects with the activity space of the illegal long-line fishers, making them significantly more vulnerable to by-catch by these vessels. It is, therefore, important to identify these at-risk times and areas, so that more focused prevention efforts can be developed to protect the species from becoming by-catch for illegal long-liners. Data for this study derives from the database of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). These data are provided at 5°x5° grid cell level, therefore, the unit of analysis here will be the 5°x5° grid cells.

A SPATIO-TEMPORAL SAMPLING PROBLEM: VARIATION IN RIVER SOUNDSCAPES COMPLICATES ECOSYSTEM MONITORING

Simon Linke, Griffith University; Simon Linke, Griffith University; Camille Desjonqueres, Paris National History Museum/University of Wisconsin; Toby Gifford, Monash University; Christopher Karaconstantis, Griffith University

Acoustic methods are gaining traction in monitoring both terrestrial and aquatic environments. However, little research has been done on appropriate sampling regimes for acoustic surveys, both in terms of spatial and temporal variation. This talk will discuss spatio-temporal sampling issues based on two studies in the Einasleigh River, Queensland, Australia that recorded fish, invertebrates and creek flow. The first study quantified spatial variation in a nested design of four neighbouring stretches of rivers that each harboured a transect of five hydrophones. Readings were taken four times a day. The second study recorded two adjacent waterholes for 6 days continuously. Differences between hydrophones in a single waterhole existed due to patchy distribution of soniferous organisms and low sound levels of fish and insect calls. However, both species accretion and acoustic indices were relatively homogenous within waterholes when recorded for 45 minutes. Between-waterhole variation was higher, but was still surpassed by diurnal variation. In the continuous recordings, variation both between waterholes and diurnally was high. While the expected diurnal patterns emerged - high insect activity at night, high activity of soniferous fish at dusk and dawn - we also found diurnal variation in the flow of a tributary creek. We also found an unexpected interaction: nightly call rates by aquatic insects were less frequent at the beginning of the measurement period which coincided with a very bright full moon. The results are encouraging for future monitoring programs: Similar to other biomonitoring techniques, sampling standards have to be developed. However, once temporal variation is accounted for, detection rates across river segments are surprisingly stable as long as sampling is temporally stratified.

A WORLD FOR EVERY CLASSROOM

John Krajewski, Strange Loop Games Inc

A presentation on our approach to educating students about the challenges we face with human impact on ecosystems, and the social solutions required to solve them. With funding from the US Department of Education, we've created an educational video game that allows each classroom to share a world together, building a civilization inside a simulated ecosystem. Eco is an online game where players must collaborate to build a civilization in a world where everything they do affects the environment. All resources come from a simulated ecosystem, with thousands of plants and animals simulating 24/7. Work together through the player-run government and economy to build the technology to stop a meteor on a collision course with the planet, without polluting the world and killing it off in the process before that even happens. Eco is a game with consequences that depends on the players' ability to collaborate. Our goal is to bring experiential learning in a world shared by students where their actions determine its fate, and the solutions

to the world's problems are not only scientific but social. Our presentation will explore the goals and impacts of our approach.

ACHIEVING 'NO NET LOSS' WITH DEVELOPMENT LED CONSERVATION? WIN-WIN LOGICS AND PERFORMING SUCCESS

Louise Carver, Birkbeck, University of London

Biodiversity offsetting (BDO) seeks compensation for habitat loss associated with infrastructure and residential development through securing gains for losses in a measurable way. As such BDO is frequently positioned as a win-win solution that reconciles economic development and conservation through delivering a 'no net loss' of biodiversity while permitting development to take place. BDO is proliferating across numerous international, regulatory policy contexts as well as being voluntarily adopted by many private firms in extractive and infrastructure sectors. While policy makers and other advocates tend to articulate this trend as a de facto indication of BDO conservation success, the empirical evidence remains at best inconclusive and more frequently attests the opposite. Drawing from a 30-month fieldwork engagement with the English BDO government pilot study, this paper investigates the constitutive processes in which the performance of BDO 'success' and NNL is enacted. The paper demonstrates that accounts of success are stabilised and performed discursively through the circulation of textual records; organisationally through alliances and networks, institutionally through accepted narratives and political dynamics; and technologically with novel calculative tools that create compelling yet abstract representations of biodiversity loss and gain. While BDO is expected to introduce efficiencies and win-win benefits to planning processes to mitigate and avoid habitat loss through development, the wider political and economic context means that it is prone to producing a range of unexpected and undesirable ancillary outcomes. These include but are not limited to; perverse incentives for habitat clearance; displacement of existing conservation funding and a democratic deficit through reduced transparency in decision making thereby throwing into question accounts of BDO 'success' that underpin its expansion.

ACOUSTIC ENVIRONMENT: CONTEXT TO UNDERSTAND THE ECOLOGY OF MARINE BIODIVERSITY IN THE ALASKAN ARCTIC

Melania Guerra, CIMAR/Universidad de Costa Rica

A marine acoustic environment (or soundscape) refers to the overall scene created by sounds from natural and anthropogenic sources underwater. Natural sounds include vocalizations from organisms such as fish, invertebrates and marine mammals, along with physical processes, for example wind-driven surface waves, earthquakes, rainfall and ice breaking, this latter a mechanism that is unique to the polar regions. Furthermore, a contemporary marine acoustic environment inescapably incorporates the footprint of anthropogenic activities, most prevalently: commercial shipping, oil and gas (O&G) exploration, development and extraction, industrial construction and dredging and military defense exercises. In order for conventional Passive Acoustic Monitoring (PAM) tools to yield ecosystem-relevant information about biodiversity, this busy and complex sound field has to be analyzed as the background against which target biological signals are detected, the ecological context in which these vocalizations are interpreted and the cause of population exposure to ambient noise levels with potential for chronic impacts, all the while also confounding the application of PAM tools. This presentation will review the current technologies that allow the long-term collection of passive acoustic data in the Alaskan Arctic, the computational analytical tools employed for their examination and the most appropriate and relevant metrics that permit the extraction of quantifiable measures of a changing acoustic environment. Given recurring observations and modeled predictions of summer sea ice retreat in the Alaskan Arctic region, it is conceivable that industrial activities will soon expand in space and time, as well as open maritime transportation lanes, transformations that will significantly alter the local marine acoustic environment even further. These threats emphasize the importance of integrating and advancing the use of acoustic monitoring techniques in conservation.

ACTION RESEARCH FOR CO-MANAGEMENT OF INHABITED PROTECTED AREAS IN MOZAMBIQUE

Nicia Giva, Eduardo Mondlane University

Reconciling conservation and people's livelihoods has faced multiple dilemmas, particularly in human-inhabited protected areas plagued with high levels of poverty and vulnerability to climate change. This paper draws from three years research in inhabited Limpopo National Park (LNP), the Mozambican park that integrates the Great Limpopo Transfrontier Park (GLTP), the most prominent in Southern Africa. Systemic action research was used to engage with ground level actors (local communities, park administration, district officials and local NGOs) in an interactive process to generate a collective understanding of the dilemmas involved in reconciling wildlife conservation and communities' livelihood needs. Through

this process actors engaged in collaborative exploration of co-management opportunities that could resonate with the local complexities and dynamics. Findings show that the process contributed to capacity building and the creation of a communicative space where actors interacted and improved their knowledge and understanding of their conflicting perspectives and needs. As a result, park staff became aware of the benefits of collaborative approaches and the improvement necessary in their praxis, and local communities enhanced their agency towards the allocation, use, and management of the 20% benefit sharing mechanism. Nevertheless, the LNP governance structures are still dominated by the neoliberal and donor-driven conservation agenda which disregards the local context of poverty and vulnerability to climate change. This paper emphasizes the need for communicative spaces across all levels of governance to address simultaneously the complexity of the conservation-livelihood interaction and to challenge the normalized and hegemonic neoliberal prescriptions.

ADAPTING CONSERVATION INVESTMENTS IN HIGH LATITUDES AND ELEVATIONS IN THE FACE OF A CHANGING CLIMATE

Molly Cross, Wildlife Conservation Society

Climate change is likely to affect conservation targets across the globe, but species at extreme latitudes and elevations face particular challenges. The rate and magnitude of warming is projected to be more extreme at high latitudes, and places closer to the poles and higher in elevation often tend to be covered in ice and snow, conditions that are especially vulnerable to warming. Confronted with rapid and large changes in climate, plants and animals in high latitudes and on mountaintops may not have options for finding nearby areas that are relatively cooler or more climatically suitable. These dramatic changes expected from climate change pose serious questions about whether and how we will be able to conserve plants, animals and human livelihoods in these landscapes–What do we need to do more of? What do we need to do differently? How do we think about our goals for nature conservation and human well-being in the face of these transformative changes? The Wildlife Conservation Society (WCS) is tackling these questions through our on-the-ground conservation work in arctic and high montane ecoregions around the world; but we are also a conservation funder that directly invests in climate-informed conservation projects in the United States through the WCS Climate Adaptation Fund. In partnership with the Doris Duke Charitable Foundation, WCS has awarded over US$12 Million to over 65 applied climate adaptation projects designed to benefit wildlife conservation across the US. I will share our experience grappling with how to invest in long-term conservation in the face of climate change, especially in systems that are highly dependent on ice and snow, and highlight a few examples of strategies that conservation practitioners are implementing in these regions. This presentation will help set up a discussion with panelists and the audience about how we can adapt our conservation approaches to address climate change impacts in extreme latitudes and elevations.

ADAPTIVE MANAGEMENT FOR PROTECTED AREAS SYSTEMS EFFECTIVENESS: CHALLENGES AND LEARNINGS FROM PERU

Paola Mejia, Sistema Nacional de Áreas Protegidas; Benjamín Lau Chiong, SERNANP; Cindy Vergel Rodríguez, SERNANP

Different Systems of Protected Areas are adopting adaptive management as an approximation to reach an effective management. This responds to the need to make decisions within a context of uncertainty and lack of information. However, its implementation faces some challenges. Aiming to share experience and find solutions based on the collective wisdom, several efforts have taken place between different countries. Among the challenges that have been prioritized are: (1) an integration of the different phases of the management cycle (planning, implementation, monitoring and evaluation), (2) an articulation between management tools used at different scales, (3) specific mechanisms to inform each phase of the cycle and, (4) a reflexive organizational culture that facilitates the integration and learning. In addition, it is recognized that sharing experiences is an opportunity to find solutions, a mechanism to backup innovations and a way to support changes in the organizational culture. Particularly SINANPE (Peru) has made an important progress in the implementation of an adaptive management, promoting changes in the approximation used to planning and the organizational culture. Currently, management plans are developed by the PA managers under a participatory process and with the support of the SERNANP`s strategic development unit. The process is based on a simplified model of the Open Standards. It has mechanisms to promote an integration across scales (PA - system), and especial relevance is given to the articulation with the territory, the Regional Conservation Systems and other conservations strategies. In addition, SERNANP is promoting the integration between the phases of the management cycle. Several challenges and lessons learned can be identified through SERNANP`s experience. The next key challenge is to incorporate mechanisms to strengthen an adaptive management approach at a system

level. Key words: protected areas, adaptive management, effectiveness

ADAPTIVE SOCIAL IMPACT MANAGEMENT FOR CONSERVATION

Nathan Bennett, University of British Columbia; Maery Kaplan-Hallam, UBC

Despite many potential social and economic benefits of conservation programs, their implementation can also produce myriad negative social, economic, and cultural consequences. Our review shows that, despite the increasing attention to measuring the social impacts of conservation, limited attention has been given to integrating results to adaptively manage these impacts over the lifespan of conservation projects. In this paper, we first examine the politics and power inherent in the quantitative turn in social impact assessment. Second, we argue that greater consideration of adaptive social impact management (ASIM), not just monitoring, in conservation governance is key to the prevention and mitigation of negative social impacts and maximization of benefits. To this end, we bring together methods from social impact assessment and monitoring, with insights from the literature on adaptive management and social learning to propose key elements of a framework for ASIM in conservation. Finally, we use two case studies to explore how different communities implicated in conservation might implement the different stages of an ASIM process in their own context. Through these examples we highlight how achieving success in conservation is as much about process as it is about outcomes.

ADEQUACY: CONSERVATION SCIENCE'S DARK SECRET

Hugh Possingham, The Nature Conservancy

"How much is enough?" is the one question that I dread to hear in conservation science. The original debate about whether 50/500 or 5000 should be considered a viable population still rages inconclusively. "How big should a single reserve be?" is another question with no satisfactory answer while for "How many reserves do we need?" the answer is 6. In this talk I briefly review these contentious issues and plot a path forward. In particular I ask the question, why do we need to know the answer? What is the decision-making framework within which knowing how much is enough is useful? I ended with some conjectures: (1) more is better, (2) we will know we have done enough when the extinction crisis ends, (3) equity between species and habitats is a much more useful question that knowing how much is enough, (4) half is not the answer, (5) do you know what income you need to ensure you will refuse more?

ADVANCED SPATIAL DATA COLLECTION WITH NATIVE PEOPLES IN SOUTH AMERICAN FORESTS

Brian Hettler, Amazon Conservation Team; Santiago Palacios, Amazon Conservation Team; Felipe Samper, Amazon Conservation Team

Our team seeks to promote the protection of South American rainforests through the empowerment of indigenous and other native peoples. Since 2015, we have been committed to increasing our capacity for programmatic impact by integrating the Open Standards for the Practice of Conservation. As monitoring and evaluation efforts are dependent on quality data, we have been strengthening our ability to collect project information in South American forest regions through the deployment of smartphones equipped with data collection applications. These apps can be tailored to a wide variety of contexts through highly customizable forms that allow for project data, geographic coordinates, and a variety of multimedia to be collected synchronously. We also are utilizing remote sensing technology to monitor project effectiveness from above. At a regional level, the development of an innovative radar-based vegetation structure map of the Colombian Amazon allows us to quantify forest cover change and identify at-risk areas. At a smaller scale, high-resolution satellite imagery allows for analysis of forest cover change in project areas to quantify impacts. These project-level satellite imagery analyses are further informed by data collected in the field with communities tied to the forest, combining the power of advanced remote-sensing technology with the unrivaled local knowledge of native and local peoples. Field data and remote sensing analysis results are later integrated into Miradi Share, a cloud-based system designed to facilitate streamlined information-sharing among our team members, allowing for the roll-up of project-level accomplishments to show overall program performance.

ADVANCES ON THE IDENTIFICATION OF OTHER EFFECTIVE AREA-BASED CONSERVATION MEASURES IN COLOMBIA

Alexandra Areiza-Tapias, Instituto de Investigación de Recursos Biológicos Alexander von Humboldt; Sandra Galan, Fundación Natura; Clara Matallana, Instituto de Investigación de Recursos Biologicos Alexander von Humboldt; Angela Santamaria, Resnatur; Clara Solano, Fundacion Natura

Colombia has made considerable efforts to accomplish the Aichi target 11, by strengthening current protected

areas and establishing new ones in ecosystems poorly represented on the national protected area system. Nevertheless, it is well known that countries will hardly achieved the Aichi target 11 by 2020 if they do not take into account Other Effective Area-based Conservation Measures - OECM. The IUCN´s World Commission on Protected Areas, specifically the Task Force on OECM, is working to establish criteria to recognize those measures and avoid misunderstandings on the issue. In those areas, conservation should be de facto, and could include areas where conservation is partial, voluntary or even ancillary. In Colombia, several efforts have been made to increase visibility and recognize different conservation strategies, some of them known as Complementary Conservation Strategies. These measures include different governance arrangements and can range from private lands to community-managed territories. The aim of this work is to presents a collection of representative cases, as well as an analysis of the criteria and the screening tool that was proposed by the IUCN, in order to identify the areas that could be consider as an OECM. We present a compilation of 45 different, with different types of governance and located in different ecosystems of the country. The analysis provides a feedback the UICN proposal and to give advice to other countries about the threshold on identifying and recognizing different measures. Some considerations in issues such as reporting, monitoring, reporting and management of this areas are made. We propose some steps to continue the process: Compilation of information on OECM from community, institutions, private sector, etc.; Promote Recognition of different forms and levels of governance; include all the stakeholders in the discussion; creating awareness on the role and importance of OECM on biodiversity conservation.

AGRICULTURE AND BIODIVERSITY IN THE 21ST CENTURY

Amy Atwood, Center for Biological Diversity

Biodiversity has enabled human societies to cultivate crops, to domesticate livestock, and to produce food and fiber, and consequently, to grow and expand. But as the world's human population continues to grow exponentially, modern industrial agricultural methods are a dominant cause of human-driven habitat losses, pollution, greenhouse gases, and species declines. Legal and regulatory frameworks of three industrialized nations seek to regulate agriculture and its impacts to biodiversity, but these frameworks do not adequately avoid or mitigate the detrimental impacts of modern industrial agriculture to biodiversity. This presentation will present an overview of such frameworks from the Earth's most populous and industrialized nations, including the U.S., India, and China, with a focus on what works and what does not. It discusses how these frameworks affect biodiversity beyond these nations' borders. Recommendations are presented for improvements to improve the ability of legal systems to address agriculture's impacts and preserve the array of plants and animals that sustains us all.

AMPHIBIAN DISTRIBUTION AND CONNECTIVITY AS A FUNCTION OF RARITY USING eDNA AND NGS

Melanie Murphy, University of Wyoming; William Funk, Colorado State University; Charlotte Gabrielsen, University of Wyoming; Andrew Gygli, University of Wyoming

Where species occur and how they are connected in the landscape may be impacted by how common a species is. Rabinowitz identified these rarity forms using the axes of geographic range (small vs. large), habitat specificity (specialist vs. generalist) and local abundance (sparse vs. dense). Greater conceptual understanding of species rarity and its biological implications is needed. We address the conservation science question: What are the consequences of species' rarity? Q1 – Is niche breadth explained by rarity? We use environmental DNA (eDNA) and species distribution models to estimate niche breath by species then test if niche breadth is 1) negatively correlated with rarity and 2) if rare species' niche breadths are unlikely to overlap (in statistical and geographic space). Q2 - What are the consequences of species' rarity on connectivity? We use genotyping by sequencing (GBS) and a landscape genomics approach to test competing hypotheses of limits to effective dispersal for species by rarity form for wetland dependent amphibians in the Front Range of the Rocky Mountains. Wetland-breeding amphibian species are often indicators of ecosystem health and rely on ephemeral wetlands for persistence. Wetlands are critically important for supporting multiple ecosystem services including biodiversity maintenance. Wetlands in the Front Range of the Rocky Mountains are likely to become more ephemeral with future climate change, even when accounting for uncertainty in climate projections, partially due to loss of snow. These impacts to species are related to species rarity.

AN OPEN-SCIENCE NETWORK FOR INTEGRATED BIODIVERSITY AND ECOSYSTEM RESEARCH IN COLOMBIA

Björn Reu, Universidad Industrial de Santander; Lina Estupiñán, Instituto de Investigación de Recursos Biológicos Alexander von Humboldt; Maria Londono, Instituto Alexander von humboldt

Colombia is one of the most biodiverse countries on Earth and is currently facing tremendous societal and

economic transformations. Formerly inaccessible areas will experience development, agricultural expansion, and intrusion of extractive industries threatening Colombia's ecosystems and biodiversity. These transformations constitute great challenges for biological conservation and ecosystem management in post-conflict Colombia and require careful conservation planning. We believe, however - beyond planning, biodiversity assessments and ecosystem monitoring - more science is needed to better understand the functioning of Colombia's socio-ecosystems, the interactions among their components, and at multiple spatial and temporal scales. With this talk we want to stimulate a discussion about how to improve integrated biodiversity and ecosystem research in Colombia highlighting some of the apparent obstacles, such as the articulation of governmental institutions, policies for data sharing, and the lack of transdisciplinary approaches. Then, we want to discuss whether and how an open- science network can contribute to better informed conservation and management strategies in an era where large data sets become freely available and where synthesis work is considered imperative. We belief, scientists and students, can play a more active role developing these strategies by generating important knowledge, complementing the work of governmental and non-governmental institutions and strengthening the science policy interface. An (inter-) national network with an open data and science policy could contribute to generate a better knowledge about Colombia's ecosystems and biodiversity. Data sharing instead of data protection may allow for a new era of ecosystem and conservation science in post-conflict Colombia. We are looking forward to discuss with you!

ANALYSING DETECTION PROBABILITIES OF BALEEN WHALES TO DEVELOP PASSIVE ACOUSTICS MONITORING PROTOCOLS

Angela Recalde Salas, Centre for Marine Science and Technology, Curtin University; Christine Erbe, Centre for Marine Science and Technology, Curtin University; Robert McCauley, Centre for Marine Science and Technology, Curtin University; Hugh Possingham, The University of Queensland; Chandra Salgado Kent, Centre for Marine Science and Technology, Curtin University

The rapid increase in passive acoustic monitoring of marine mammal populations and anthropogenic impacts has led to the development of monitoring protocols. Such protocols are often generalized in terms of species and/or habitats and usually do not consider the effectiveness of detecting only vocalising animals. Imperfect detections can lead to biased abundance estimates and inadequate decisions when mitigating impacts. This study aimed to evaluate the likelihood of detecting vocalising groups of blue and humpback whales travelling through Geographe Bay, Western Australia based on the visually detected ones. Detection was modelled by combining visual and acoustical datasets using a Bayesian approach. We considered five groups of variables to model detection variability: ecological, environmental, behavioural, physical and operational (i.e., recording schedule). Results showed that humpback whales had a higher detection probability and were vocal for longer periods of time than blue whales. However, when comparing the visual to acoustic detections, blue whales presented a better fit. For humpback whales, a discrepancy between visual and acoustic detections was observed 39% of the time with one group detected acoustically compared to 2-6 groups detected visually. The acoustically undetected groups were usually mothers and calves or multiple adults. In comparison, in blue whales there was disagreement between visually and acoustically detected groups only 4.8% of the time, and there was no bias towards a particular group type. For both species, detection was affected by behavioural and physical factors. These results showed that acoustic monitoring protocols cannot be generalised over all species. The recording schedule should be considered to maximise the likelihood of detecting less vocal species (i.e., blue whales). For more vocal species (i.e., humpback whales) it is necessary to develop protocols that effectively detect quieter cohorts (i.e., mother and calves).

APPLICATION OF THE NEW KEY BIODIVERSITY AREA KBA CRITERION FOR ECOLOGICAL INTEGRITY

Martin Robards, Wildlife Conservation Society; Justina Ray, Wildlife Conservation Society Canada

A new ecological integrity criterion in the KBA Standard has been designed ("Criterion C"). This standard identifies truly outstanding examples at the global scale of still-natural and intact areas that maintain fully functional ecosystem types and their components and are therefore critical for sustaining biodiversity. In North America, large tracts of natural habitat remain in northern Canadian and Alaskan boreal and arctic environments, offering both an ideal opportunity to work through the particulars of this criterion, and most importantly to identify candidate sites that qualify. This will be useful both to help formulate specific guidance for application of Criterion C and to serve as a model for identification of Criterion C KBAs elsewhere in the world.

APPLYING ARTIFICIAL INTELLIGENCE TO ANALYZE THE GROWING MOUNTAINS OF DATA FROM ENVIRONMENTAL SENSORS

Matthew McKown, Conservation Metrics, Inc.; Ted Schmitt, Vulcan

Outcome based decision frameworks have transformed medicine, education, agriculture, and development. Conservation has often lagged other fields in embracing the data-driven revolution, largely because of the difficulty and expense of collecting meaningful ecological data over large areas or long time-scales. The reality of habitat loss, climate change, overharvesting, and other threats driving biodiversity loss makes it imperative that we test and compare approaches to conservation in order to identify new solutions, and retire ideas that don't produce results. We must also be able to able to act more quickly and at global scale. Recent technological advances in distributed sensor networks and remote sensing capabilities promise to produce vast amounts of new data. Artificial intelligence can be used to identify threats such as illegal activities, and provide the robust and cost-effective metrics of ecological change needed to compare management outcomes. We present a summary of state-of-the art approaches, as well as case studies, of how we have applied artificial intelligence to analyze data from conservation projects. Examples include identifying illegal fishing patterns, detecting anomalous behaviour, image recognition, change detection, acoustic surveys for seabirds, frogs, insects, turtles, and anthropogenic impacts. Our teams have contributed to dozens of projects monitoring endangered species and measuring ecosystem responses to management and restoration actions around the globe. We describe how data from different sensors (acoustic, visual) and sensor platforms (drones, aircraft, cube-satellites) can be leveraged to monitor animal populations, habitat quality, and wildlife impacts. Our goal is to collaborate with practitioners, regulators, and funders to help realize evidence-based decisions in conservation.

APPLYING SOCIAL MARKETING TO REDUCING DEMAND FOR WILDLIFE: THREE CAMPAIGNS EXPERIENCES

Livingston White, Caribbean Institute of Media and Communication, The University of the West Indies; Leo Douglas, Columbia University, New York City; Kelvin Alie, Wildlife Trade Program, International Fund for Animal Welfare, Washington DC; Shira Yashphe, School of International & Public Affairs, Columbia University, New York City

Overexploitation is the second-biggest threat to biodiversity after habitat destruction. We focus on a specific component of this complex issue, namely the potential value of applying Social Marketing programs in changing the relationship between end-users and high-value wildlife commodities, and thus, reducing consumer demand. However, efforts to inspire such behaviors have often been stymied by an overdependence on information disseminating. We review three campaigns designed to influence select consumer segment's demand for shark fins, ivory and rhino horn in Asia. We surveyed campaign managers, appraised campaign evaluation, reviewed popular articles discussing the campaigns, and reflected on the social marketing literature. We paid attention to socio-cultural contexts, intervention pretesting and implementation monitoring, the use of market research, the creation of exchanges with target consumers, and the application of behavior change theories. We also examined how these programs modified their intervention approaches in response to evaluation research. The review illuminates best practices of social marketing's power in moving people beyond raised awareness to influencing social norms. We show how a growing appreciation of culturally-complex identity issues and the need to incentivize behavior change have driven recent trends in these campaigns' social marketing approaches. The paper describes how the expectations of the implementing NGO's evolved in keeping with the social marketing literature and established behavior changes models. Drawing on the achievements of these campaigns, we highlight potential gaps for further interrogation by the conservation community, and recommend a framework informed by social marketing theory for other NGOs seeking to use behavior change methodologies for wildlife-product demand reduction and related conservation concerns.

ARE MARINE PROTECTED AREAS TACKLING THREATS?

Caitlin Kuempel, QLD; Kendall Jones, University of Queensland; Hugh Possingham, The University of Queensland; James Watson, Wildlife Conservation Society

The world is rapidly expanding its system of marine protected areas, with a 513% increase in marine protection since 1990. In many cases, the benefits we receive from protected areas are still unclear because we do not know the counterfactual, or what would have happened in the absence of protection. The interplay between irreplaceability (i.e., how much do we stand to lose) and vulnerability (i.e., threat, how likely are we to lose it without intervention?) in conservation priorities has gained attention over recent years, particularly in the terrestrial realm. While some contend that we should be protecting the most threatened areas (reactive approach),

others maintain that we need to protect the last of the remaining large, intact landscapes (proactive approach). In the marine realm, the dichotomy between reactive and proactive protection has received considerably less attention. There has been criticism of the continued designation of large, isolated protected areas; however, the degree to which countries are targeting or avoiding threats in the sea has yet to be quantified. We aim to assess this question by investigating the relationship between marine protected area establishment and threat level in recent years. In doing so, we identify the dominant marine conservation priority approach, unveil general patterns in marine threats and protection, and discuss what this could mean in terms of adequacy and biodiversity conservation in the world's oceans.

ARE PRIVATE HORTICULTURAL COLLECTIONS SPECIES' SAVIOURS OR DRIVERS OF EXTINCTION?

Lauren Gardiner, Royal Botanic Gardens, Kew

The importance of botanic garden collections for the conservation of plants has been widely documented – from their ex situ cultivation of species in living collections and storage in seedbanks such as Kew's Millennium Seed Bank, to their active programmes of practical field-based and research-driven conservation work in situ, the guiding principles of the Global Strategy for Plant Conservation, and the work of organisations such as the Royal Horticultural Society and Plant Heritage in the UK, and Botanic Gardens Conservation International. This presentation will highlight the contribution to species' conservation offered by private horticultural collections, and their owners, all too often maligned as the drivers of charismatic, desirable species' extinction. The 'Orchid Fever' days of Victorian plant hunters driving tropical orchids such as Paphiopedilum to the brink of extinction in the wild are unfortunately far from over but the collections of amateur and private growers around the world represent important but often overlooked reservoirs of threatened species' genetic diversity, protected from the threats faced by wild populations. Private horticultural collections, whether working independently, or with botanic gardens and conservation organisations, have an important role in protecting plant species from extinction. Many species new to science have been discovered in private collections, leading to far-reaching expeditions to discover and protect these taxa in situ. Species with low genetic viability in the wild may finally be able to produce viable progeny when crossed with horticultural collections collected from before the wild population became genetically bottlenecked. Critically Endangered species have been used as flagship taxa to engage the public and policymakers, and through the sustainable harvest and distribution of seeds, species secured in public and private collections around the world and funds raised to protect the species in situ.

ASSESSING ALIEN AND INVASIVE PARROT IMPACTS IN EUROPE USING A TRANSPARENT EVIDENCE-MAPPING FRAMEWORK

Rachel White, University of Brighton

Invasive alien species (IAS) present an increasingly urgent economic, societal and environmental problem worldwide. Effective policy and management responses are thus essential, but rely on the ability to assess IAS impacts before conclusive empirical evidence is available. Consequently, a range of risk and impact assessment schemes have been developed. To be objective, such schemes require a transparent and inclusive evidence-mapping procedure. However, instead they currently promote use of the precautionary principle and remain something of a "black box", with little control on the quantity and quality of evidence incorporated by experts. Here, we present a framework for comprehensively reviewing and mapping existing evidence of IAS impact for any prescribed study area – allowing robust, transparent and replicable assessments to be undertaken. To illustrate the utility of this framework we applied it to the 11 species of non-native parrots currently established within Europe. Peer-reviewed and grey literature in multiple languages were searched systematically for impact evidence. Some 337 accounts of evidence were collated from 210 sources. This database, for the first time, enables an evaluation of the quantity, quality and spatial distribution of impact evidence for parrot species in Europe. For example, most evidence (40%) was for agricultural impacts; however, this largely comes from the native range with limited evidence from Europe, despite some species having very large populations. Within Europe, most sources report on interspecific competition with local species (38%), but severity of impact scoring were low. Overall, the majority of evidence (70%) was of anecdotal quality. The presented framework will assist both researchers and policy makers by directing future research priorities and informing recommendations for management solutions – both of which are vital for designing effective evidence-informed policy responses/conservation decisions for IAS.

ASSESSING CHANGES TO ECOSYSTEM FUNCTION IN LATIN AMERICA

Carlos Zambrana-Torrelio, EcoHealth Alliance; Amira Apaza, UNDP; Miguel Fernandez, UNDP; Erica Johnson, EcoHealth Alliance; Maria Oliveira-Miranda, Instituto de Recursos Naturales; Jon Paul Rodriguez, Instituto

Venezolano de Investigaciones Científicas; Irene Zager, Provita

Several ecosystems around the world are threatened by severe change that results from a combination of climate change, habitat conversion, pollution, and overexploitation. Many of them are extremely important in supporting critical ecosystem services, however, accessible and actionable information to evaluate the degree of threat, the risk of collapse of these ecosystems, as well as to prioritize responses, and measure interventions' success is still insufficient. The Red List of Ecosystems (RLE), provides a particularly interesting alternative to evaluate conservation status at landscape level in regions where in-situ information is scarce. Here we apply some of the criteria of the RLE, in combination with Essential Climate Variables and Essential Biodiversity Variables (ECVs and EBVs), obtained from modeled data and earth observation systems, in three pilot ecosystems in the Tropical Andes, to demonstrate the value of this holistic and systematic concept. These integrated concepts can help us to establish a pilot system of prioritization of ecosystems that can easily scale to other data limited regions towards building a global biodiversity monitoring network.

ASSESSING THE COST OF GLOBAL BIODIVERSITY AND CONSERVATION KNOWLEDGE

Brian Mac Sharry, UNEP-World Conservation Monitoring Centre

Knowledge products comprise assessments of authoritative information supported by standards, governance, quality control, data, tools, and capacity building mechanisms. Considerable resources are dedicated to developing and maintaining knowledge products for biodiversity conservation, and they are widely used to inform policy and advise decision makers and practitioners. However, the financial cost of delivering this information is largely undocumented. We evaluated the costs and funding sources for developing and maintaining four global biodiversity and conservation knowledge products: The IUCN Red List of Threatened Species, the IUCN Red List of Ecosystems, Protected Planet, and the World Database of Key Biodiversity Areas. We estimate that US$160 million (range: US$116–204 million), plus 293 person-years of volunteer time (range: 278–308 person-years) valued at US$ 14 million (range US$12–16 million), were invested in these four knowledge products between 1979 and 2013. More than half of this financing was provided through philanthropy, and nearly three-quarters was spent on personnel costs. The estimated annual cost of maintaining data and platforms for three of these knowledge products (excluding the IUCN Red List of Ecosystems for which annual costs were not possible to estimate for 2013) is US$6.5 million in total (range: US$6.2–6.7 million). We estimated that an additional US$114 million will be needed to reach pre-defined baselines of data coverage for all the four knowledge products, and that once achieved, annual maintenance costs will be approximately US$12 million. The methods, key results and implications of this unique study with over 40 co-authors, published in PLOS One journal in 2016, will be presented and discussed.

ASSESSING THE ROLE OF PAS IN THE CONSERVATION OF VERTEBRATES IN LATIN AMERICA: ON THE GROUND DATA

German Forero-Medina, Wildlife Conservation Society; Robert Marquez, WCS; Leonor Valenzuela, Wildlife Conservation Society

Protected Areas (PAs) are one of the main strategies for conservation of biodiversity worldwide. In Latin America, where rapid deforestation and ecosystem degradation continue to occur, PAs are established with the purpose of counteracting these threats and avoid species loss. However, most areas lack rigorous monitoring programs to assess the effectiveness for conservation. Recent studies have focused on remote sensing data and matching techniques to evaluate effectiveness of PAs in a quasi-experimental way. Fewer studies rely on the ground data to assess such impact for variables different than land cover. For example, many PAs are established with the purpose of ensuring persistence of populations of vertebrates. However, few studies are designed to evaluate the effect of PAs for the conservation of these species, using quantitative, quasi-experimental designs, like the ones implemented using remote sensors. Such experimental designs may allow for regional assessments of PAs effectiveness and an understanding of the factors that contribute to success. We present a set of examples with quantitative assessments of species populations, using occupancy estimation or distance sampling, conducted inside and outside of a particular PA. In some cases, PAs maintain the last remaining habitat of a species, in other cases there is habitat left outside the PA, but not of enough quality, like Selva de Florencia National Park and the Brown-Spider Monkey (Density in PA= 4,3 ind./km2; outside=0). Other examples show the PA per se is not responsible for a higher occupancy, as for the Andean Bear in Tatamá National Park (Occupancy inside=0,64; outside=0,58, no effect). In other cases, a PA may show effect for some species but not for others. If conducted systematically, this approach would allow evaluation of effectiveness at large scales, in a similar fashion and additionally to the remote sensing analyses.

ASSESSMENT OF THE QUALITY OF INPUT DATA TO APPLY THE CRITERIA OF THE IUCN RED LIST OF ECOSYSTEMS

Alberto Alaniz, Magíster en Áreas Silvestres y Conservación, University de Chile, CFT Medio Ambiente IDMA; Mauricio Galleguillos, Universidad de Chile; Jorge Pérez-Quezada, Universidad de Chile

The efforts and actions of conservation have been focused mainly in species or population levels. However, the UICN has recently developed an analogous methodology to the Red List of Threatened species to assess the risk of ecosystems following similar criteria, creating the Red List of Ecosystems (RLE). Among the most important challenges to the application of these criteria is the gathering and availability of information, which could represent a constraint. Our study presents a complementary method to integrate other sources of information to apply UICN-RLE, through the estimation of spatial and temporal quality of the information available in scientific publications. This method was used to assess 21 ecosystems in the central Chile biodiversity hotspot. We used spatially explicit studies that identified changes in ecosystem function or/and structure, allowing the quantification of reduction or disruption. The spatial and temporal quality of the assessment were estimated as the percentage of coverage of potential ecosystem distribution and the time frame suggested by UICN to each criterion, that the studies represents to each ecosystem. We were able to assess 85% of the ecosystems present in this area, which were classified with ranges of temporal quality between 30 to 100% and spatial quality from 12 to 100%. Eight of the 17 evaluated ecosystems had more than 50% of spatio-temporal quality, representing the 22.9 of the study area. Our methodology could be useful to facilitate the application of UICN red list criteria in other countries, improving the efforts to develop national or regional RLE as a tool for ecosystem conservation.

BALANCING CARBON, FORESTRY, INDIGENOUS AND MINING VALUES IN THE CONGO

Hedley Grantham, Wildlife Conservation Society; Djoan Bonfills, World Resources Institute; Fiona Maisels, WCS; Tim Rayden, Wildlife Conservation Society; Samantha Strindberg, Wildlife Conservation Society; Ayesha Tulloch, University of Queensland

Through an USAID funded initiative, The Africa Biodiversity Collaborative Group, we are exploring methodological approaches for spatial prioritization and scenario analysis in landscapes with high biodiversity value as well as multiple human uses and threatening processes impacting species. Our aim is to develop guidelines for applying spatial prioritization and scenario analysis to biodiversity conservation and land-use planning in Africa. In this talk we present a case study from northern Republic of Congo (ROC) and illustrate synergies and differences between this and other African planning landscapes including Eastern DRC, Madagascar and western Tanzania. For northern ROC, we provide an overview of our spatial prioritization approach that focuses on minimizing the loss and degradation of forests, and maximizing biodiversity and carbon benefits. We show how to apply knowledge of above-ground biomass and human pressures to inform planning about where ecosystems are in better or worse condition. We introduce our landscape accounting methods that enable different prioritization and scenarios to be explored, and their benefits/costs measured (e.g. wildlife abundance). The assessment is informing a REDD+ initiative and needs to balance conservation with: forestry, industrial agriculture (oil palm), smallholder agriculture, infrastructure and mining developments. We will highlight the importance of scoping current and potential land-uses upfront to identify the best opportunities and constraints for conservation outcomes when designing a landscape prioritization.

BASIN-LEVEL TRADE-OFFS BETWEEN CONSERVATION AND HYDROPOWER DEVELOPMENT IN THE MAGDALENA RIVER

Diego Hincapie Ossa, The Nature Conservancy; Hector Angarita, The Nature Conservancy; Juliana Delgado, The Nature Conservancy; Rafael Kelman, PSR; Tainá Martins, PSR; Justus Reapple, The Nature Conservancy; Carlos Rogéliz, The Nature Conservancy

The Magdalena River basin, currently home to 33 million people (77% of Colombia's population), faces the great challenge of balancing the use and conservation of freshwater systems and values. Freshwater biodiversity is threatened in the basin, being concurrently affected by water pollution, deforestation, mining and energy development, expansion of the agricultural and livestock frontier, habitat fragmentation, hydro-morphological changes, introduced species and overfishing among others. Furthermore, the development of a number of new hydropower dams is expected in the next three decades to contribute to the country's plans of expanding the renewable energy supply. In this study, we assessed the economic trade-offs of potential hydropower expansion in relation to basin-level freshwater biodiversity and ecosystem productivity. First, we identified trade-offs between hydropower development and freshwater impacts based on historical development in the basin. Second, in order to demonstrate alternative paths of trade-offs between conservation and new infrastructure

development, we developed comparative analyses of the global system-level benefits. Specifically, we compared historical practices in the definition of energy expansion plans with a novel approach. Historically, energy expansion plans have not taken into consideration the broader impacts on freshwater biodiversity and productivity; the proposed approach, on the other hand, optimizes economic variables over different energy expansion scenarios including criteria to avoid or minimize downstream impacts, cumulative habitat impacts due to river network fragmentation, direct footprints of new infrastructure and potential impacts on the distribution of migratory, endemic, and other groups of species. Results of the comparative analyses demonstrate that alternative approaches to energy expansion can effectively achieve conservation goals at the basin level with limited economic impacts.

BIOCULTURAL APPROACHES TO SUSTAINABILITY INDICATOR DEVELOPMENT: OPPORTUNITIES AND CHALLENGES

Eleanor Sterling, Center for Biodiversity and Conservation, American Museum of Natural History; Erin Betley, Center for Biodiversity and Conservation, American Museum of Natural History; Kate Burrows, Yale School of Forestry & Environmental Studies; Sophie Caillon, National Center for Scientific Research; Katherine Careaga, Center for Biodiversity and Conservation, American Museum of Natural History; Joachim Claudet, National Center for Scientific Research-CRIOBE; Georgina Cullman, Center for Biodiversity and Conservation, American Museum of Natural History; Rachel Dacks, Department of Biology, University of Hawaii at Manoa; Christopher Filardi, Conservation International; Nadav Gazit, Center for Biodiversity and Conservation, American Museum of Natural History; Stacy Jupiter, Wildlife Conservation Society; Joe McCarter, Center for Biodiversity and Conservation, American Museum of Natural History; Manuel Mejia, The Nature Conservancy; Christian Rivera, Department of Ecology, Evolution, and Environmental Biology, Columbia University; Amanda Sigouin, Center for Biodiversity and Conservation, American Museum of Natural History; Tamara Ticktin, Department of Botany, University of Hawaii at Manoa; Anne Toomey, Pace University

Biocultural approaches—those that explicitly build on local values and perspectives and that address the inextricable link between people and their environment—are increasingly used to bring systems level thinking to sustainable resource management. These approaches facilitate development of sustainability indicators that are culturally-grounded, help capture the full complexity of systems, and are better suited for local decision-making than externally created ones, which can be ineffective or detrimental to existing local structures and systems. Biocultural approaches yield different indicators than those focused on biodiversity or on human well-being. Despite these potential advantages, key challenges remain in the identification, implementation, and measurement of indicators developed by these approaches (including the difficulty of multiple definitions of 'biocultural'). Indicators that integrate both biological and cultural aspects can be challenging to identify and communicate, given the inherent multidimensional nature of the relationships and feedbacks they are measuring. This complexity creates additional challenges when trying to measure, standardize, and categorize indicators, important for facilitating meaningful translation across scales, as their interrelated nature resists discrete groupings. We present our results from comprehensive literature reviews and ongoing on-the-ground efforts—including workshops with government officials, academic researchers, place-based practitioners, and NGOs. We have explored the boundaries of 'biocultural' definitions, identified and analyzed a range of existing indicators adapted or derived from biocultural approaches, and identified characteristics of social-ecological resilience that are not currently measured in international goals. We provide recommendations for how indicators can be developed to better inform integrated management of land- and seascapes and result in more effective and just conservation outcomes.

BIRD-PLANT MUTUALISTIC NETWORKS IN NATURAL AND PLANTED ECOSYSTEMS IN A HIGHLAND PROTECTED AREA

Juan Alejandro Morales-Betancourt, Universidad de Caldas; Patricia Orozco-Montoya, Universidad de Caldas; Néstor F. Alzate-Q, Universidad de Caldas; Gabriel Castaño, Universidad de Caldas; Andrés Pardo-Trujillo, Universidad de Caldas; Juan Salazar-Ramírez, Universidad de Caldas

The effect of land conversion on biodiversity is a subject of major concern in conservation biology. However, most of the studies on this topic have been focused on the assessment of species diversity, while functional components such as plant-animal interactions remain poorly understood in anthropogenic landscapes. In this context, we aimed to compare the nectarivorous bird-flowering mutualistic networks in two secondary forest fragments and three anthropogenic habitats (two exotic tree plantations and one open field). Overall, 18 species of nectarivorous birds carried 84,987 pollen grains of at least 35 species, establishing a network of 149 interactions. According to rarefaction curves, species richness of nectarivorous birds did not differ between habitats.

Nonetheless, the number of interactions (I) and the diversity of pollen loads (S) were higher in the open land (I=72, S=24) and in the forest plantations (I=60, S=23) compared to the secondary forest fragments (I=43, S=17). These results make evident functional differences between anthropogenic and native forest habitats, and suggest that planted ecosystems may result in 'hotspot traps' of plant-animal interactions. This finding is of concern, since reforestation process using exotic tree species as well as the presence of open lands with ornithophilous alien species therein may eventually exert negative changes in the bird-flowering networks in this protected area. Moreover, our results strongly suggest that diversity itself is a deficient proxy of the conservation value of tree monocultures stablished for rehabilitation of degraded ecosystems. Consequently, future reforestation and monitoring plans should include the study of plant-animal interactions and go beyond species diversity as the only measure taken into account for assessing the effectiveness of restoration programs.

BITING THE HAND THAT FEEDS YOU PRIORITIES FOR CONSERVATION AND HUMAN WELLBEING IN CENTRAL AMERICA

Michael J. Liles; Stacey Sowards, University of Texas at El Paso; Markus Peterson, University of Texas at El Paso

Most of the world's threatened species are found in biodiversity hotspots in low-income regions. The juxtaposition between high biological diversity and low economic wealth poses complex problems that intertwine the fates of biodiversity conservation and human wellbeing, as exemplified by sea turtle conservation in Central America. For instance, hawksbill turtles (*Eretmochelys imbricata*) are highly endangered in the eastern Pacific Ocean, yet their eggs continue to be an important subsistence resource for impoverished coastal residents in El Salvador. In this study, we use naturalistic inquiry to explain the realities experienced by coastal residents who share habitat with hawksbills in El Salvador, and then suggest implications of the disparities between these realities and international priorities for hawksbill conservation and community development in El Salvador and other low-income regions. We detail the analysis of interviews conducted with tortugueros (i.e., local sea turtle egg collectors) over seven years to help explain how hawksbills fit into local human realities. Our results demonstrate that, from the perspective of tortugueros, (1) the primary importance of hawksbills is the economic value attached to egg sales, but there exists a deeper connection to local culture; (2) egg purchase by hatcheries is a socially just conservation strategy that benefits both hawksbill and human wellbeing; and (3) opportunities for local residents to participate in decision-making regarding sea turtle conservation are limited, and should be increased. We argue that aligning international conservation priorities with local community development realities is one path toward contributing to long-term sea turtle recovery while simultaneously dismantling the array of context-specific constraints to resource management provoked by the historic marginalization and systematic disfranchisement of impoverished residents in resource-depended areas of low-income regions.

BNS AS AN EVALUATION TOOL OF MANAGEMENT AND POLICIES IN THE LOW RIO NEGRO MOSAIC, AMAZONAS, BRAZIL

Alessandra Ribeiro, Wildlife Conservation Society; Guillermo Estupinan, Wildlife Conservation Society; Karl Didier, Wildlife Conservation Society

Conservation and development projects often need to monitor their impacts on human wellbeing. Basic Necessities Surveys (BNS) are a relatively new method for assessing human wellbeing based on local perceptions about which goods and services are indispensable for a good life. The method relies on focal groups and structured interviews with community members to construct of an index of human welfare in a community, that varies from 0 (very low) to 1 (very high). Between 2015-2016, we applied BNS in 31 communities in 5 of the 12 protects areas (PAs) that comprise the Lower Rio Negro Mosaic in Amazonas State, Brazil. While these PAs are geographically connected, they differ in terms of the historical context of their creation, legislation which guides their management and, as a result, the kind of community development projects that occur within them. Our BNS surveys allowed us to compare wellbeing of communities in the different PAs of Mosaic, and will eventually allow us to track changes in wellbeing over time. Results indicate that PAs vary widely in terms of human wellbeing, with BNS index values ranging from 0.33 to 0.79. The worst index values were generally from strictly protected areas where development policies and public investment in community development are lacking. Supplementary surveys also indicate that communities within these PAs suffer from a lack of capacity to organize themselves, both internally and among communities. Another factor that directly influenced the index values was access to basic services (i.e., education, health, energy and water supply), which were highly valued in all communities. In this regard, communities that are closest to urban centers or that benefit from infrastructure projects tended to have higher BNS index values. In our judgement, Basic Necessity Surveys produce indicators that are highly useful for

evaluating relationships among management, public policy and community wellbeing.

BRINGING UP CONSERVATION AND RURAL DEVELOPMENT IN A BIODIVERSITY HOTSPOT

Cristina Gomez Garcia-Reyes, National Natural Parks Unit

The post-conflict scenario in Colombia is triggering landownership transitions and influencing land-use changes in the countryside. Regions that were once marginal are being inserted in new logics of agricultural suitability, and transformed throughout pilot projects implemented under the peace agreement umbrella. Such is the case of the Serranía de San Lucas (SSL hereafter), a biodiversity hotspot located between two main water arteries of the country that endow it with highly valued biogeographic conditions. SSL is part of the Magdalena-Urabá moist forests ecoregion and is recognized as a 'pleistocene refugium' leading to high levels of biological speciation and diversity. With its wide altitudinal range, fertile soils, vast gold reserves, dense forests, abundant watercourses and watersheds nourishing vast northern flood plains, SSL is a historically appreciated nodal point subject of successive territorial conflicts. These lands are walking a tightrope between planned conservation and the forthcoming opening of the cadastral system. Zoning plans and development schemes seem dissimilar and the growing award of exploitation rights, drug crops, and illegal mining among other colonization pressures, appear as the major obstacles for conservation efforts, and as the major challenges for any fruitful rural development model. The design of effective policies that avoid a resource debacle while reinvigorating rural settings is imperative. At a policy level, Colombian government is a key instance to structure human-environmental interactions and guide decision-making about land use. We work to bring up integrated strategies that can help to prevent further ecological damages and to avoid unrestrained rural transformations in priority areas for conservation facing hectic land-use transitions. That is, to promote coexistence and cooperation between rural development and conservation in an inspiring canvas of new pacifist development prospects.

BUILDING AN INCLUSIVE AND DIVERSE COMMUNITY TO PROTECT THE OCEANS

María De Lourdes Martinez Estevez, UNAM,UCSC

Lack of inclusion and diversity is an alarming symptom of our societies' functioning. It has permeated at all levels and conservation science is not the exception. For instance, it has been demonstrated that the demographic composition of most U.S. environmental institutions does not reflect that of the country; an uncomfortable truth that is not particular of a place or a sector of the society. Despite several calls have addressed this issue, priorities and policies still need to be modified to truly create a society for all. The Marine Section of the Society for Conservation Biology is keen to foster diversity and the inclusion of people involved in ocean's conservation. The 4th International Marine Conservation Congress (IMCC4) in 2016 in St. John's, NL, Canada was an important forum to put in place initiatives that reduced barriers and created a friendly and secure environment for all the participants. IMCC4 was also the place to discuss the establishment of a marine diversity network (MDN) as another attempt to increase diversity in marine conservation. The mission of this initiative is to create a collaborative, online network that focuses on issues in marine conservation, and comprises people that represent the diversity of scientists, educators, and practitioners in the field. The network would serve to bring together people from across the globe to share knowledge, experiences and ideas that lead to future collaborative work. If successful, this network will help close the gaps that weak our ability to find synergistic solutions to ocean's conservation problems. This talk will contextualize the meaning of diversity crisis and inclusion in conservation science, and it will present potential individual and collective actions to this important matter.

BUILDING CAPACITIES TO IMPROVE COUNTER WILDLIFE TRAFFICKING EFFORTS IN PERUVIAN BORDERS

Yovana Murillo Vega, Wildlife Conservation Society, WCS

Peru is a megadiverse country with thriving wildlife trafficking. Between 2000 and 2015 the Peruvian Forestry and Wildlife Service (SERFOR) registered more than 67,000 confiscations of live animals from the illegal trade. Different efforts have been made to combat illegal wildlife trafficking around the country including its borders. Since 2016, WCS in close coordination with SERFOR, and with USFWS support, has assisted the Peruvian government control and enforcement agencies in establishing inter-agency alliances to combat illegal wildlife trade in priority border areas. Main actions include (1) training to Peruvian government officials and (2) generation of specific information on wildlife trafficking through border areas of CITES listed species and/or included in IUCN's red list. Specialized training has been provided to at least 92 officials from 17 governmental agencies on issues related to wildlife trade regulations and controls, and working closely with SERFOR to ensure exchange of relevant information to support and feed into their planning so as to improve wildlife trade controls in the Peru – Ecuador border area.

BUSHMEAT SUPPLY CHAIN IN GHANA AND IMPLICATIONS FOR RISK OF ZOONOTIC DISEASE SPILL-OVER TO HUMANS

Yaa Ntiamoa-Baidu, University of Ghana; Kofi Amponsah-Mensah, University of Ghana; Jones Quartey, DABCS-University of Ghana; Hannah Sackey, University of Ghana;

Many wild animal species exploited for bushmeat have been implicated in the transmission of zoonotic pathogens to humans and domestic animals, some of which, like the Ebola Virus, have caused deadly diseases with high fatality. The 2013 outbreak of Ebola Virus Disease (EVD) in West Africa prompted extensive public awareness campaigns. These included messages against bushmeat consumption resulting in total collapse of the bushmeat trade in Ghana with huge losses in livelihoods and financial capital. We investigated the bushmeat supply chain and actors at highest risk of potential zoonotic disease transmission in Ghana based on two major bushmeat markets, Atwemonom (Kumasi) and Kantamanto (Accra). The data were collected through direct market observations and questionnaire interviews. Each of the markets received bushmeat supplies from a wide catchment on daily basis. We define five pathways by which bushmeat reached the consumer from the producer. Each pathway involved 2-6 identifiable groups of actors, including bushmeat wholesalers, stockers (a hitherto un-reported group), market load carriers, butchers, retailers and chop-bar operators. The operations of each group entailed a varying degree of contact with fresh bushmeat, and hence blood and body fluids of animals and risk of potential pathogen transmission. The actors at highest risk were hunters, butchers, traders and chop-bar operators. While there was a high degree of awareness about the EVD (98% of 1,045 respondents), the high-risk groups were most sceptical about the link between wild animals and zoonotic disease transmission. We conclude that tackling zoonosis prevention through banning of bushmeat is unlikely to be sustainable due to the high socio-economic pressures, and recommend targeted actions that promote environmental hygiene and awareness among the high risk groups, with a campaign message that focuses on "cautious interactions between humans and wild animals" rather than "bushmeat consumption"

CAN CULTIVATION OF THE ECONOMICALLY VALUABLE XATE PALM TAKE PRESSURE OFF ITS WILD POPULATIONS?

Sophie Williams, University of Wales, Bangor; Robert Annewandter, Carreg y Fedwen Cyf; Julia Jones, University of Wales, Bangor

Captive breeding and cultivation of overharvested species is frequently proposed as a conservation strategy, yet there is little evidence under what conditions the strategy is effective. We focus on the case of a heavily harvested xaté palm species (*Chamaedorea ernesti*), in the Greater Maya Mountains (central America). We conducted 222 household interviews to explore characteristics of those involved in wild harvesting, we then interviewed 38 farmers who had been involved in a training programme aimed at encouraging cultivation, and 50 interviews with farmers not included in the training programme five years after the training programme to explore what factors influence whether a farmer started to cultivate xaté. Finally, we built a bioeconomic model to investigate the socioeconomic conditions favoring cultivation over wild harvesting and likely impacts of improvements in harvesting on the wild population. Training was associated with greater technical knowledge about xaté cultivation and higher belief in their ability to cultivate it. Technical knowledge and socio-economic variables such as forest ownership were predictors of whether individuals cultivate xaté suggesting training programmes can have a long-lasting effect on individuals but other barriers to cultivation, such as access to seeds or appropriate markets, will need to be addressed. Our modelling suggests however that those switching to cultivation are unlikely to be wild harvesters (because of barriers such as land ownership) and that switching to cultivation may not has a positive effect on populations. We found increasing alternative income sources reduces harvesting pressure and the provision of alternative livelihoods would more directly reduce pressure on the wild population. We urge caution in assuming that people will readily adopt cultivation of wild harvested species or that this would necessarily reduce impacts on wild populations.

CAPACITY DEVELOPMENT, CONSERVATION AND MUSEUMS

Ana Porzecanski, Center for Biodiversity and Conservation, AMNH; Felicity Arengo, Center for Biodiversity and Conservation, AMNH; Mary Blair, Center for Biodiversity and Conservation, AMNH; Eleanor Sterling, Center for Biodiversity and Conservation, AMNH;

A growing body of evidence indicates that the public learns much of what it knows about science outside of the formal education system. Natural history and science museums (NHMs) are in a unique position as a venue for communicating science because of their high credibility ratings and level of trust they invoke in the public. NHMs have receptive and diverse audiences, and can raise awareness and engagement in conservation among their visitors through powerful experiences in permanent exhibit

halls, thematic temporary exhibitions, public programming, and sustained mentoring and training programs. To engage the public further in biodiversity research and conservation, many museums have developed citizen science programs, collaborations between scientists and citizen volunteers. Finally, in addition to public programs aimed at general audiences, NHMs also provide advanced training in biodiversity science, curriculum development, and teaching strategies in conservation through site-based and online courses for students, teachers, and practitioners. For example, The AMNH's Network of Conservation Educators and Practitioners (NCEP) works to improve the availability, quality, and access to high quality, current educational resources for conservation teachers, professionals, and trainers around the world. Promoting understanding, awareness and stewardship of biodiversity to broad museum audiences requires a multidimensional strategy, using appropriate messages, approaches, and technology for effective communication. NHMs have a captive and diverse public, and are well positioned to mobilize large audiences into the conservation fold.

CHALLENGES AND PERSPECTIVES FOR PLANT CONSERVATION: A STUDY CASE FROM BRAZIL

Rafael Loyola, Universidade Federal de Goias;

Brazil holds the largest flora in world with more than 35 thousand described native species, being 53% of them endemics. However, a large portion of its flora is poorly known and more the 2000 species are threatened with extinction. In Brazil, plants are threatened by a number of different large-scale human-induced pressures and one of the first challenges that we face for elaborating the instruments for plant conservation are related to the acquisition and organization of all essential data for supporting action and policy making. In my presentation I will show how we are dealing with that and how we are making progress to achieve the Global Strategy for Plants Conservation (GSPC) targets, using the experience of the National Centre for Flora Conservation – CNCFlora, as a case study for discussing the reason of successes in pursuing some targets, and some perceived failures during this process. We offer information that might help other countries, decision and policymakers to address the difficulties and move themselves towards achieving GSPC's targets.

CHALLENGING OLD MODELS OF CARNIVORE CONSERVATION IN SWEDEN AND THE UNITED STATES

Tarla Peterson, University of Texas El Paso

We critically examine how neoliberal colonialism may encourage wildlife crime against carnivores, and discuss how future policy initiatives could incorporate critique of neoliberalism into wildlife conservation. In addition to supporting a massive illegal market, illegal hunting and fishing threaten wildlife and fisheries stocks important to livelihoods, threaten endangered species, support unsustainable quasi-warfare between paramilitary ranger units and illegal harvesters around protected areas, and promote ever more draconian deterrence models for addressing wildlife crime. Our idea of neoliberal colonialism draws from Ramutsindela's description of post-colonial contexts where people have not personally been subjected to colonial rule, but are required to conceptualize nature as it is framed within the cultures of western colonizers. We argue that neoliberal hegemony has contributed to wildlife crime in many contexts, including among human cultures previously identified as colonizers. Our approach emphasizes the historicity of oppressive political structures to explain how local residents may frame wildlife protection as resulting from historic oppression, and relying on neoliberal economic hegemony to operate. Using a comparative analysis of conflicts over carnivore conservation in Sweden and the United States, we explore how neoliberalism's tendency to convert nature into alienable property has created its own brand of wildlife crime by construing those participating in previously acceptable subsistence and recreational activities as criminal deviants. We conclude by suggesting that approaches to wildlife conservation policy, across all continents inhabited by humans, should include analyses of (1) how people engaging in wildlife crime frame the political context and its impact on their lives, (2) how the subjectification process linked to neoliberal colonialism influences wildlife crime, and (3) how alienation of labor contributes to wildlife crime.

CHANGING TIDES: EVOLUTION OF COMMUNITY-BASED CONSERVATION TOWARDS SPIRITUAL ECOLOGY

Dekila Chungyalpa, YETI, Yale University

There is a growing convergence among world religions and indigenous faith systems on the importance of protecting their sacred landscapes and cultures from anthropogenic forces. This trend exemplifies a paradigm shift in biodiversity conservation, away from exogenous fixation on exclusionary biodiversity values and towards community-based conservation led by representative leaders who belong to these sacred landscapes. While such a trend can be seen as an extension or a relabeling of community-based conservation or religion and conservation projects attempted in the past, empirical

evidence from such projects show practical changes in how knowledge and learning are applied and adopted within the indigenous communities in these landscapes. One such example is Khoryug, an eco-monastic association of over 60 Tibetan Buddhist monasteries and nunneries dedicated to protecting the environment of the Himalayas and Tibetan Plateau, which is merging religious and environmental practices and thereby transforming cultural values and traditions to embody a spiritual ecology framework. At the same time, the conservation potential of such an approach is greatly limited by the lack of understanding displayed by implementing agencies towards faith-based leadership, leading to the lack of participation of faith leaders in policy making processes.

CLIMATE CHANGE AT HIGH ELEVATIONS AND LATITUDES: THE CHALLENGE FOR CONSERVATION

Healy Hamilton, NatureServe; Ned Gardiner, NOAA;

Temperature over land has increased disproportionately in high latitudes and altitudes. These rising temperatures have led to a dramatic melting of Arctic sea ice and reduced spring snow cover, at a pace greater than that simulated by climate models. In boreal, tundra, and alpine ecosystems, observed environmental changes include an increase in the amount of winter precipitation falling as rain, permafrost melt, changes in streamflow magnitude and timing, and intensifying disturbance regimes from drought, insect pests, and fire. These changes are shifting the distribution and composition of vegetation in high altitude and latitude ecosystems. Increased cover of wood and shrub in tundra, increased productivity of deciduous species in boreal forests, and a decline in productivity of evergreen forests are among observed responses. Combined with more frequent and intense disturbance events, large scale transitions of vegetation distribution and composition are anticipated over extensive areas. The rates of change in these ecological processes are expected to increase in this century. Conservation goals are challenged in such rapidly changing, relatively remote ecosystems. In situ species – focused conservation applied to maintaining historical patterns of abundance and distribution may prove impossible. A more dynamic conservation approach might focus on maintaining ecological processes such as cycles of disturbance and recovery, and maintaining guilds for ecological function. Landscape conservation goals that optimize the configuration and connectivity among conservation areas can influence their resilience to change. Protected areas around the world generally over represent high altitude and latitudes, and tend toward expansive sizes. This provides substantial opportunity to better understand biotic responses to change in systems otherwise relatively free of human disturbance, which can help inform conservation across a wide range of diverse ecosystems.

CLIMATE CHANGE EFFECTS ON WILDLIFE AND HUMAN LIVELIHOODS IN ARCTIC BERINGIA

Martin Robards, Wildlife Conservation Society

Global changes in climate, connectivity, and commerce are having profound impacts on the Arctic environment and inhabitants. In concert with these impacts, there is widespread recognition of the value of incorporating different worldviews and perspectives when seeking to understand the consequences of change. In turn, attention to local needs, perspective, and cultures is seen as essential for fostering effective conservation and adaptation planning. Factors supporting these needs, what may be termed actionable environmental intelligence, can be understood through engaging the emerging literature referring to "knowledge co-production." This field focuses on how different models of the science-policy interface affect the organization of knowledge production and its effective application in decision-making. Such an approach goes beyond observing or assessing change from different scales and perspectives, to understanding conditions that support the co-production of actionable knowledge, and tools that can incorporate the close and dynamic relationships between people, wildlife, and habitats that straddle cultures, timescapes, and sometimes national boundaries. I demonstrate this approach through a suite of Alaskan cases studies. I demonstrate that long time-lines (a decade or more) and consistent funding are frequently required for fostering the co-production capacity necessary for understanding and responding to specific place-based problems. We highlight how co-management bodies representing Alaska Native groups, indigenous regional governments, and non-governmental organizations (often tied to specific philanthropic foundations) frequently act as boundary organizations. Individual experts are critical within these boundary organizations, providing trust as brokers of knowledge across worldviews and political or legal motivations. Over time communities of practice may form, buffering the loss of key leaders within specific efforts.

CO-BENEFIT COST-SAVINGS THROUGH OPTIMIZED SOURCE WATER PROTECTION ACTIVITIES: THE CASE OF COLOMBIA

Jorge Leon, The Nature Conservancy; Adrian Vogl, Natural Capital Project; Carolina Aguirre, The Nature Conservancy; Alejandro Calvache, The Nature Conservancy; Mauricio Echeverry, The Nature Conservancy; Aparna Sridhar, The Nature Conservancy

Source water protection can generate benefits that go beyond safeguarding water quality, including in the areas of biodiversity conservation, climate change mitigation and adaptation, and human health and well-being. Activities designed to achieve targets across these areas are often implemented independently of one another, potentially incurring greater total cost than if activities were optimized across multiple areas. We analyzed the cost-savings of achieving sediment, nutrient, and carbon targets through optimized portfolios of source water protection activities within the source watersheds of six of Colombia's largest cities. We selected Colombia for our analysis because of a suite of enabling policy conditions that favor adoption of source water protection programs, and a national-level commitment to integrating work across multiple sustainable development areas. We find a range of 13 to 95 percent cost savings when land uses are optimized to achieve multiple goals simultaneously rather than individually, representing on average a 63 percent savings in public investment. Additionally, we find that the same portfolios could result in increases in potential base flow contribution from 2 to 11 percent, suggesting additional water available in these source watersheds that could translate to improved dry season water availability. We will discuss these findings and how similar approaches could be used in other geographies and at finer scales to make the case for investment in source water protection by a range of actors and institutions.

CO-EXISTENCE IN A TIGER RESERVE IN INDIA: COMPLEX INTERACTIONS BETWEEN PEOPLE, WILDLIFE AND FORESTS

Gladwin Joseph, Conservation Biology Institute

We unpack the dynamic nature of `co-existence' and its impacts on both people and the forests. We present the results of our published study looking at changing livelihood strategies over three-time periods from 2008-2015. This will be complemented by results from other published research on the spread of invasives, long term monitoring, and on tiger densities to argue that `co-existence' is partially successful. Both tiger numbers and the well-being of local communities appear to be stable. However, the surrounding dry deciduous forests are being choked by the invasive Lantana camara. Decline in minor forest products has also impacted the livelihood strategies of the local communities. Their agricultural practices have moved away from shifting cultivation to settled mixed crop farming, and more recently to cash crop cultivation of coffee, maize and cotton. The shift to cash crops was driven largely by wildlife depredation of food crops. The invasive-choked forest reduces forage for wild animals possibly driving them to feed on farm crops. Income from minor forest products has declined in recent years indirectly resulting in a preference for cash generating crops. Improved state-subsidised food supply has also reduced dependence on food crops. The indigenous community display remarkable social resilience by continuously adapting and diversifying their livelihoods against structural changes, and leveraged rights historically denied to them. In conclusion, co-existence works for tigers and people, but at the expense of declining forests. Unless the State invests in enlightened management of the forests that includes the local people, that allows for prescribed fires, combined with invasive removal and restoration, the health of the forests is in peril.

COLLABORATIVE AND APPLIED SCIENCE: THE PATHWAY FOR INTEGRATING THE ECOSYSTEM APPROACH

Carolina Del Lama Marques, IUCN; Miguel Avila Moraes, IUCN; Danielli Kutschenko, International Union for Conservation of Nature

Performing effective conservation planning in a rapid changing world requires a common systemic vision between science and society that facilitates the applicability of knowledge to decision making and conservation planning. In addition, the intrinsic fluidity of ecological fluxes and processes make it ineffective to plan and implement conservation measures based on a territorial perspective. Therefore, it is a demand for all countries in Latin America to integrate an ecosystem approach and develop common tools to allow monitoring, comparison and integration of national data to a continent-wide biodiversity overview. Based on previous experiences in Brazil with the Red List of Ecosystems and the Red List of Threatened Species, one pathway to reach these innovative integrative frameworks is clear: build solutions based on the reality and needs of national governments to ensure large-scale and long-term adhesion. Identifying the institutional and scientific strengths and weaknesses of the previous species assessment process in Brazil, for example, highlighted the importance and benefits of adopting a global framework. The IUCN Red List of Threatened Species criteria are now legally established and more than 21,000 species were assessed in the last 5 years with the support of near 1,800 specialists, which significantly contributes to the global database. The same can be done for ecosystems in a collaborative way between Latin American countries. By analyzing the currently used decision-supporting tools and understanding the main gaps, challenges and needs of the national environmental policies, which may not be so different between these nations, it is possible to collectively build solutions and effectively integrate

standardized instruments, especially the Red List of Ecosystems. This could be a major contribution for the global conservation agenda, while integrating for the first time a comprehensive ecosystem-based approach to a regional scale strategy.

COMMUNICATION OF NATIONAL AND SUBNATIONAL INDICATORS FOR DECISION MAKERS

Maria Londono, Instituto Alexander von humboldt; Ivan Gonzalez, Instituto Alexander von Humboldt

Decisions for conservation, research, negotiation and intervention of biodiversity and ecosystems should be made as informed as possible. For decision makers in developing countries national and subnational information is dispersed, making its access and synthesis difficult. The Humboldt Institute is a boundary institution that seeks to narrow the gap between science and policy, as such we have been developing a web platform that communicates biodiversity indicators about the state and knowledge of biodiversity. The indicators have been prioritized and responded to goals and commitments of national and international scope. The calculation of these indicators has been regionalized to be of use to local authorities and researchers and they are reported using time series or by taxonomic group. Within the set of statistics that can be consulted is the Red List Index, number of species with Red List assessments, spatial information gaps, regional listings of known species, regional lists of potential species, taxonomical representativeness of open access databases and ecosystem transformation. The Red List Index shows the decrease in the conservation status of all the groups for which it was calculated. The spatial void index indicates a progressive increase in the surface of the country with biological information, although this value depends on the spatial scale of analysis. The representativeness of species in databases shows a differential growth of open access available information given several taxonomic groups. We expect that this web platform lowers the threshold for national and regional environmental authorities to use and appropriate biodiversity information as it enables interactivity and manipulation of the data, its visualization and reporting through maps and graphs that can be download in different formats and interpretation of indicators based on the relationships with other indicators in regional contexts.

COMMUNITY PARTICIPATION IN CO-MANAGED PROTECTED AREAS IN MADAGASCAR: FROM 'SUCCESS' TO REALITY

Caroline Ward, Sustainability Research Institute, University of Leeds

The elusive 'win-win' in conservation aims to provide benefits to both biodiversity and human well-being. An example of this is the shift in governance of protected areas (PAs) towards community participation, aiming to provide socio-economic and biological benefits by incorporating local knowledge, increasing accountability of decision making and perceived legitimacy of rules. Yet studies show varying ability to meet the criteria for success defined by these projects, and we lack insight into how and why. Here I utilise a case study in Madagascar to understand how new governance forms can play out in reality, and what this means for their 'success'. Madagascar has recently established a new network of PAs co-managed by local community associations (VOIs) and NGOs, aiming to encourage sustainable resource use and local ownership of the environment. Qualitative and quantitative data were collected in 2015/16 from multiple stakeholder levels, using questionnaires, focus groups and interviews, surrounding a PA in Madagascar, co-managed by 10 VOIs and a national NGO. High level stakeholders identified that fewer negative impacts on local communities and sustainable natural resource use would be criteria for 'success' in new PAs; promoted via local community involvement in PA governance through establishment of VOIs. However, in the case study PA, households perceived limited benefits and high costs to participating in VOIs. Remote villages and poorer households perceived the most costs. Households considered provisioning ecosystem services important, yet changes in governance led to inequalities in access. These results highlight the differences between what may be considered criteria for 'success' and what can happen in reality. Using a fine-scale approach when evaluating the 'success' of conservation interventions and the heterogeneous nature of communities, may better illustrate why this shift in PA governance is not always achieving the benefits to which it aims.

COMMUNITY-BASED FOREST MANAGEMENT: A CASE STUDY OF JOINT FOREST MANAGEMENT IN SIKKIM, INDIA

Paulami Banerjee, The University of Texas at El Paso, UTEP; Tarla Peterson, The University of Texas El Paso, UTEP

The Joint Forest Management (JFM) program laid a foundation for decentralized forest governance in India. As an instrument for sustainable forest management, JFM

seeks to provide natural resource-dependent communities with active roles and meaningful opportunities to participate in management of local forests. Despite claims of successful implementation of the program since its inception in the 1990s, JFM in India has been driven by external donors rather than by local communities, and has been oriented toward ecological targets that do not consider the livelihoods of human communities. Recognizing that successful community-based forest management should include both resource professionals and local communities, this study seeks to encourage locally adaptive and collaborative forest governance that facilitates sustainable development by enabling grassroots participation. We explore the impacts of JFM on the livelihoods of rural forest-dependent communities in Sikkim—a remote, northeastern state of India bordering Nepal, Tibet, China and Bhutan. We conducted multi-sited ethnographic research, interviewing 230 members of rural forest-dependent communities, foresters and members of local self-government institutions over a period of 15 months. We also conducted two workshops, a first of their kind in the region that provided a diverse group of stakeholders with a shared platform for interaction and constructive dialogue. Through activities such as forest history mapping, storytelling, resource mapping and systems thinking exercises, the workshops promoted trust building and mutual learning, while encouraging participants to see themselves as active agents of a complex forest management process. Participants developed deeper understanding of the complexity of forest management, highlighting ways that locals and forest professionals may jointly develop locally relevant and adaptive problem-solving approaches to forest management.

COMPARING ACQUISITION STRATEGIES FOR PRIVATE LAND CONSERVATION REVOLVING FUNDS

Mathew Hardy, RMIT University; Sarah Bekessy, RMIT University; James Fitzsimons, The Nature Conservancy; Ascelin Gordon, Victoria

The acquisition of private land with conservation value is an important part of global conservation efforts. Revolving funds allow conservation organisations to acquire private land with conservation value, and then on-sell it to new owners, in the process recouping costs and adding a permanent conservation agreement. However, constrained by property turnover, the conservation gains achieved by revolving funds over time will be linked to the acquisition strategy used. Drawing on historical acquisition and sales data from all major revolving fund programs in Australia, we developed a simulation model to explore the potential outcomes from a range of acquisition strategies (with varying prioritisation of ecological benefits, financial returns, and mixes of the two) and initial fund sizes ($1m, $5m and $20m). From a simulated pool of 20,000 properties, we ran the model through two scenarios, varying the minimum conservation values for acquisitions. We found that minimum conservation values had the largest effect on conservation gains, with the low minimum delivering greater overall gains, but the high minimum delivering greater high value gains. The outcomes of strategies varied between fund sizes, but in general the resale-focused strategies delivered consistently higher overall conservation gains, but relied on revolving a greater number of properties. The larger ($20m) fund delivered the greatest conservation return on investment for both overall and high value conservation gains. Our results suggest restricting acquisitions to high conservation value properties may constrain overall conservation gains, but could deliver greater high value gains. The conservation gains achieved by revolving funds may differ considerably depending on the strategy used, particularly for smaller funds. Increasing the size of revolving funds may allow for their greater contribution to private land conservation, but only if the supply of and demand for conservation properties exist.

COMPLEXITIES OF CONSERVATION IN REGIONS IN CONFLICT

Duan Biggs, Griffith University

Many biodiversity rich parts of the world are affected by conflict. Cold War 'proxy wars' plagued numerous African countries post-independence, and in some cases those wars have continued albeit at a lower level. Similarly, Latin American countries have been affected by conflicts varying from 'drug-wars' to internal power struggles, and interventions by external powers. Armed conflict presents many challenges for achieving conservation outcomes. Yet the end of conflict presents many complexities and challenges for conservation. In some cases, the end of conflict enables access to previously inaccessible regions leading to deforestation and habitat loss. However, the cessation of armed conflict also presents opportunities for the development of economic activities that align with conservation such as nature-based tourism. Yet, the legacy of the social impacts of armed conflicts can persist for many years presenting challenges to conservation efforts. For example, the Mozambican civil war together with the low level conflicts in Apartheid-era South Africa created social conditions that persist to this day and exacerbate the rhino poaching crisis that has affected this part of the world in recent years. Therefore, careful assessment and consideration of the range of socio-economic and political

conditions is necessary in planning for the achievement of conservation outcomes in regions where armed conflicts are coming to an end such as Colombia. A failure to do so may lead to high rates of habitat destruction and biodiversity loss or the implementation of interventions that are not likely to be sustainable in post-conflict societies and regions.

CONNECTIVITY CONSERVATION AREAS GOVERNANCE IN COSTA RICA

Olivier Chassot Labastrou, Connectivity Conservation Specialist Group, World Commission on Protected Areas

Costa Rica has a long tradition of effective connectivity conservation management that started under the conceptual and programmatic umbrella of the Mesoamerican Biological Corridor. The country's policy framework on connectivity conservation and the civil society's efforts to implement conservation measures that favor connectivity make it a study case for the adoption and implementation of the new IUCN designation of Areas of Connectivity Conservation (ACC – currently under review). Costa Rica's enabling conditions include a system of protected areas within a larger connectivity landscape concept, a practitioner's agenda that drives the policy agenda rather than the opposite, a set of laws and policy aimed at biological corridors governance (policy statements, planning tools, regulatory instruments, economic incentives), and open and inclusive participatory mechanisms (a national, regional and local multi-level participatory platform that allows the management of biological corridors). Lessons learnt include: adaptive management and multi-disciplinary approach, transparency in the management of funds and information, consensus decision-making, strong leadership, and applied research as the foundation for the improvement of management at the landscape-connectivity scale.

CONSERVATION ACTION PLANS FOR PLANT CONSERVATION IN A MEGADIVERSE COUNTRY, COLOMBIA

Cristina Lopez-Gallego, Universidad de Antioquia, Colombia

With more than 26.000 species, Colombia has the second greatest diversity of plants in the world. Appropriate knowledge to support conservation is difficult to obtain, and in a country with great ethnic diversity and complex socio-economic scenarios, an adaptive management approach is required. Within the institutional framework of the national strategy for plant conservation, we are advancing on red listing as an effective way to compile information and monitor trends on the conservation status and threats for species. Furthermore, we are implementing conservation action plans for prioritized groups, including groups of biological or ecological relevance (Cycads, Magnolids, Orchids), socio-economic relevance (palms, timber trees), and groups that are important components of strategic ecosystems (dry forests, paramos). These charismatic focus-groups act as umbrella to promote the conservation of many other species. In addition, our plans require a diverse array of conservation strategies, from collaborating with public and private protected areas for protection and restoration, to finding creative ways to manage species for sustainable uses as incentives for conservation. The red listing and the conservation action plans are being used as inputs to define "important plant areas" and to contribute to ecosystem- and area-based conservation programs. Our conservation action plans are collaboratively designed and implemented by stakeholders from academia, botanical gardens, conservation NGOs, and environmental authorities. These conservation plans intend a good balance between experiences from academics and practitioners. In collaboration with plant-conservation institutions from Brazil and South-Africa, we are exchanging experiences to strengthen our conservation plans in aspects like contributions from traditional knowledge and citizen-science, managing large networks of experts at the national level, and closing the gap between knowledge and decision-making.

CONSERVATION AGREEMENTS AND PRIVATE CONSERVATION MECHANISMS IN COLOMBIA

Clara Solano, Fundacion Natura

The reciprocal water agreements are a payment for environmental services strategy, which aim to solve a water quality and regulation issue in Las Cruces river basin, in Norte de Santander department. The water from this basin is used by 12,800 inhabitants of the San Vicente de Chucuri town. The payment involves the owners of the high areas, the beneficiaries, the water administration company (Administradora Pública Cooperativa Manantiales de Chucurí) and the municipality. An annual payment is given to the land owners who sign an agreement with which they commit to change land use from agriculture to conservation, prevent pollution and diminish land erosion. In order to manage the resources, a local fund was created and the water administration company was strengthened. To date, 2,258 voluntary contributions from the community have been received, 61 agreements have been signed, 490.5 hectares of natural ecosystems are being conserved or restored, 703.5 hectares of cacao, coffee and grass have been managed with good practices. A Reciprocal Water Agreement (Acuerdo Voluntario por el Agua-ARA-) is: 1) A voluntary agreement, 2) with local and

global benefits, 3) is based on reciprocity, 4) includes the principle of conditionality, 5) involves a local institution, 6) its financing becomes permanent and 7) interests and conflicts are negotiated.

CONSERVATION CRIMINOLOGY APPROACHES FOR MANAGING DEMAND FOR WILDLIFE PRODUCTS

Meredith Gore, Michigan State University; Jessica Kahler, Michigan State University

Global demand for wildlife products is driving unsustainable exploitation of populations at a scope and scale never seen before. Unsustainable trade is often illicit, associated with other forms of criminality, involves human and animal violence, and poses risks to both biodiversity and people that interact with it. Conservation criminology is one interdisciplinary and applied paradigm for understanding programs and policies designed to influence human behavior vis a vis unsustainable trade. By integrating principles from natural resources management and conservation biology, risk and decision science, and criminology and crime science, conservation criminology-based approaches improve environmental resilience, biodiversity conservation, and secure human livelihoods. We profile demand for high-value wildlife products in Namibia, Madagascar, Indonesia, and the United States. Across the different sociocultural, geospatial, ecological, economic and conservation contexts, conservation criminology can enhance understanding of the unsustainable wildlife trade. For example, risk perception-based theories of change, a wildlife crime adapted tool from crime science that aids understanding factors that drive the demand for different wildlife species (i.e., C.R.A.V.E.D.) and situational crime prevention techniques that improve understanding of opportunity structures underlying demand, and factors potentially influencing the efficacy of demand-reducing interventions. Although myriad benefits can be realized by using conservation criminology approaches to manage demand, key barriers remain. We discuss these strengths and limitations within the context of conservation social science to promote integration of theories and methods.

CONSERVATION DECISION MAKING FOR PROTECTED AREAS IN LATIN AMERICA

Viviana Ruiz-Gutierrez, Cornell Lab of Ornithology; Goldstein Isaac, Wildlife Conservation Society

Protected areas are considered as one of the most effective strategies for conserving the world's biodiversity and natural capital. Although Latin America has the most land within protected areas in the world, 45% of all areas in the region are significantly threatened by land and forest degradation. There is a critical need for effective conservation and management actions to preserve the integrity of protected areas in Latin America. For most protected areas in the region, staff and officials often lack access to basic sources of information needed to develop and prioritize actions. To best address this challenge, we need cost-effective, scalable tools that can provide robust information that is directly linked to the decision-making infrastructure of the protected areas themselves. Here, we present an overview of the issues at hand, and provide examples of case studies in protected areas in Central and South America of cost-effective approaches for collecting information al multiple scales. We further present how this information is used to guide conservation and management on the ground. In addition, we present examples of platforms and approaches for collecting information that includes the participation of the communities themselves in the data collection and decision-making processes.

CONSERVATION DRONES: QUANTIFYING WILDLIFE MONITORING ACCURACY USING BIRDS

Jarrod Hodgson, University of Adelaide; Lian Pin Koh, Eth Zurich

Wildlife monitoring informs effective ecological management. Unmanned aerial vehicles (UAVs) are an increasingly reliable and economical tool for wildlife population monitoring but there is a limited understanding of the quality of resulting data. Using simulated seabird colonies with a known number of individuals, we compared the population estimates made by experienced ground counters with digital counts of individuals in imagery captured via a UAV. Blind UAV-derived counts completed using imagery sensed at multiple heights were more accurate and precise than the traditional technique estimates. We also investigated the effect of ground sample distance on the ability to detect individuals in images, as well as the level of training required to create a semi-automated detector with a given error rate. The improved accuracy and precision offered by this technique allows the identification of trends in population fluctuations at a finer scale and therefore provides the opportunity for more proactive management.

CONSERVATION PLANNING AND BUSINESS: REDUCING UNCERTAINTIES CUTTING COSTS AND IMPROVING OUTCOMES

Jenny Arias Escandon, The Biodiversity Consultancy; Leon Bennun, The Biodiversity Consultancy; Eugenie Regan, The Biodiversity Consultancy

Biodiversity and ecosystem services are increasingly material issues for business, especially for industrial-scale developments with a direct footprint on nature in sectors such as agriculture, mining, energy and infrastructure. Government regulation and lenders' conditions are becoming more stringent, and expectations of good practice are rising accordingly among stakeholders and investors. A 'no net loss' approach to biodiversity is now commonly required, putting the onus on business to avoid, minimise, restore and if necessary offset any negative impacts. Businesses often spend substantial sums collecting ecological data to apply the mitigation hierarchy. This information may not be available in a timely fashion to inform key design decisions, especially early in the project planning process. Baseline studies also often fail to take a wider landscape perspective. These problems can be reduced through spatial conservation plans that identify the most sensitive species and sites, and highlight landscape-level ecological processes and linkages. Such plans are, however, often delinked from economic and social planning, or other environmental plans such as for climate change adaptation. This routinely leads to negative outcomes for biodiversity, because businesses attempting to implement good practice are not on a level playing field with others; cumulative impacts may not be addressed; and mitigation measures may be undermined by other, unrelated developments or pressures. Landscape-level plans that balance and integrate economic, social and conservation aims, developed with the full participation of key stakeholders, could greatly improve overall outcomes for business, society and biodiversity.

CONSERVATION PLANNING FOR THE PROTECTED AREA SYSTEM AND PRIORITY ECOREGIONS IN CHILE

Maximiliano Sepulveda, Corporación Nacional Forestal; Irina Montenegro, WWF Chile

The integration of conservation initiatives into large landscapes (ecoregions or countries) is a major challenge given the need for an adequate understanding of goals and interests from territories destined to conservation (state protected areas) to territories destined to production (forest or aquaculture areas). Different organizations require tools and mechanisms that allow them to effectively plan their conservation initiatives towards achieving higher impacts. Standardized methodologies provide a common language to facilitate the coordination in large conservation landscapes among different types of organizations and people to facilitate communication. One of these tools, widely applied worldwide is the Open Standards for Conservation Practices (OS). In 2015, the planning methodology of the National System of Protected Areas of the State of Chile was revised. This review updated the planning methodology by integrating the OS as the central axis of adaptive planning and management. On the other hand, the Valdivian Temperate Forest and Chiloense ecoregions are the priority sites where WWF-Chile has developed a formal agenda since 2011. An adapted version of OS called WWF Program and Project Management System has been adopted to diminish ecological footprint from key commodities production in Chile, as well as promote biodiversity conservation. At the moment OS has allowed an easy language of understanding between the actors (NGOs and Government sector) associated with the management of protected areas. The definition of clear strategies associated to threat control and conservation targets within large landscapes worked by different types of stakeholders presents important challenges as adequate funding and monitoring, where important progress is being made. In this way, we hope that a better integration of different organization´s agendas can be generated, increasing efficiency in conservation management, monitoring, assessment and capacity building.

CONSERVATION SCIENCE FOR POLICY

Mark Burgman, Imperial College London

When the Australian Centre of Excellence for Risk Analysis was set up in 2006, it was intended to act as a scientific institution serving government, improving the scientific basis for environmental decisions. Its initial structure was ineffective, providing outputs that were academically interesting but operationally ineffective. This presentation outlines how, over the course of 5 years, the governance arrangements and relationships evolved to a point where the Centre became a trusted partner and delivered research outcomes that affected the work practices and improved the efficiency of thousands of people involved in conservation actions.

CONSERVATION STRATEGIES AT NATURAL HISTORY MUSEUMS: AN OVERVIEW

Felicity Arengo, Center for Biodiversity and Conservation, AMNH; George Amato, American Museum of Natural History; Mary Blair, Center for Biodiversity and Conservation, AMNH; Christopher Filardi, American Museum of Natural History; Ana Porzecanski, Center for

Biodiversity and Conservation, AMNH; Eleanor Sterling, Center for Biodiversity and Conservation, AMNH

Through science-based programs, natural history museums (NHMs) have played a critical role in conservation. Specimen collection, inventory, and taxonomic and systematic study continue to evolve through new technologies, revealing new information about each specimen or artifact in the face of accelerating environmental change. Geographic and biological data in collections is increasingly used for conservation planning and priority setting, and to guide management under climate change. NHMs are natural locations for multi- and transdisciplinary work, convening scientists, local communities, and the public, catalyzing linkages between locally driven management and cultural dimensions of diversity. NHMs are leading innovative, long-term partnerships that connect local and global communities and stakeholders, and draw from multiple sources of knowledge for conservation action on the ground. The conservation impact of NHMs includes new protected areas around the world, and participatory research that strengthens biodiversity management and policy. NHMs raise awareness and engagement in conservation among their visitors through powerful experiences in exhibitions and public programming. For NHMs to inspire informed engagement of society as whole in conservation, we need to capitalize on access to information to promote action-oriented solutions; catalyze diverse communities to co-curate exhibitions and resources; and expand our toolbox to include innovative, cross-disciplinary approaches for maximum outreach and impact. NHMs should make a concerted effort to diversify their workforce to achieve broad and lasting conservation outcomes, while transforming how we think of, exhibit, and interpret "natural histories," our role and responsibility in the biodiversity crisis, and innovative ways of bridging separation between nature and culture to help catalyze a multiplicity of success stories—models for a diverse, sustainable, and resilient society.

CONSERVATION THROUGH A COMMUNICATION FRAME: VALUING THE JOURNEY AND THE DESTINATION

Ruth O'Connor, Australian National University; Joan Leach, Australian National University; Lilly Lim-Camacho, CSIRO; Fabien Medvecky, University of Otago; Jeanne Nel, Nelson Mandela Metropolitan University

"Natural resource management is a people problem"* and so it is underpinned by communication—participants creating meaning and applying different sources of knowledge to an issue. In this paper we will explore how we might construct the notion of success in conservation intervention through a communication lens. Specifically, what is valuable to institutionally based decision-makers engaging with science in two contexts. The first context is the incorporation of climate adaptation science into regional biodiversity management plans in Australia. The second context is knowledge co-production to underpin freshwater conservation in South Africa. The value of applying communication theory to processes of conservation intervention is it encourages us to understand and value processes of dialogue and deliberation in addition to successful outcomes such as behaviour change. The cases highlight the importance of true empowerment of all participants in setting the agenda and creating meaning. We also find that the credibility and relevance of science can be greatly enhanced through effective deliberative processes. Further, we find that while science is often synonymous with expertise, practical knowledge is highly regarded by decision-makers. Finally, we find dialogue can build trust among individuals with a range of outcomes such as commitment to science products, and development of trusted sources of knowledge.

**case study interviewee*

CONTRASTING FUNDAMENTAL RESEARCH AND CITIZEN SCIENCE FOR CONSERVATION

Shannon Bennett, California Academy of Sciences; Rebecca Johnson, California Academy of Sciences; Scott Loarie, California Academy of Sciences; Meg Lowman, California Academy of Sciences

In the face of accelerating biodiversity loss and the potential destabilization of earth's living systems, museums can play a unique role, from providing fundamental data to engaging citizens, in finding solutions. In their classic sense, natural history museums steward the record of life through time, a basis for fundamental research on life's origins and how it might continue in a changing future. But increasingly museums are engaging citizens as partners to provide orders of magnitude more information about the distribution of different life forms, collectively known as biodiversity. Because natural history museums have simultaneous goals of collecting biodiversity data and engaging people with nature, and because they are perceived as trustworthy institutions, they are in a unique position to galvanize citizen scientists and use these data, along with historical collections, to solve global challenges. The ground swell of citizen-contributed data is providing a living record of Earth with enough resolution to document changes in biodiversity and inform sustainability solutions. Keys to success for effective citizen science include facilitated data collection with experts and the ability for clear mission orientation. One powerful scalable enabler is the online social platform iNaturalist, where people

contribute natural history geolocated photographs, track their efforts online, and virtually partner with experts around the world to identify taxa in near real time. iNaturalist has grown exponentially since its launch in 2011, now with over 3.5 million observations of over 100,000 species contributed by over 350,000 observers. iNaturalist now accounts for 83% of all visual records on GBIF. Here we report on citizen science efforts that have fueled unprecedented extensive high quality data leading to sustainability outcomes, from guiding federal and state responses to invasive species, to correcting range maps of critically endangered or threatened species.

CONTRIBUTING TO THE EFFECTIVE MANAGEMENT OF THE MESOAMERICAN REEF

Marisol Rueda, Healthy Reefs for Healthy People Initiative

The Healthy Reefs Initiative is a collaboration of over 65 international, regional, and local partner organizations working to conserve the Mesoamerican Reef, producing biennial Report Cards (RC) on the ecological health of the reef and Eco-Audits (EA) measuring the management response. The 2015 RC includes 248 sampling sites in Mexico, Belize, Guatemala and Honduras. It evaluates reef condition based on a Reef Health Index, which ranks measured values for: coral cover, macroalgal cover, herbivore and commercial fish biomass. The 2015 RC measured a slight improvement in overall reef health from 2.5 (in a scale of 1 to 5) in 2012 to 2.8 in 2014. While the Index is useful for summarizing the complexity of reef health, taking a closer look at individual indicators helps to understand the sources of declines and develop management actions, which are recommended to the government, private sector, academia and NGOs. The EA's measure the extent in which these are implemented in the MAR countries, in a set of 28 indicators, which help to catalyze stronger management actions in 7 prioritized themes: MPAs, Fisheries, Coastal zone management, Wastewater treatment, Research, Sustainability, and Global marine themes. This brings accountability for needed changes/policies to improve reef health.

CONTRIBUTION OF PURCHASED PUBLIC LANDS TO BIODIVERSITY CONSERVATION IN COLOMBIA

Juan Gomez Candamil, Universidad de Los Andes; Clara Matallana, Instituto de Investigación de Recursos Biologicos Alexander von Humboldt; Christoph Nolte, Boston University

Land acquisition for conservation in Colombia has being drive by a law in 1993, which require to all the municipalities and regional governments to invest 1% of their annual budget on buying land in order to protect water sources. Following this law many municipalities had acquired land in strategic places, nevertheless there are not significant studies that demonstrate that this measure is effective for ecosystem conservation. Preliminary studies had shown that there is not a database on the acquired land and many of them are difficult to located due to the lack of geographical information. Also, there are not studies on the relationship of this strategy with the protected areas system. This work develops an overview of the expansion of the protected area system in Colombia between 1993 and 2016 with particular attention to the creation and zonation of new protected areas and land acquisition for conservation. Also, it develops an overview of spatial data available with regional institutions (departmental governments and autonomous regional corporations) to inform the development of a research project on the spatial determinants of protection (including land acquisition for conservation) and its benefits for the protection of the biological diversity of Colombia.

CONTROL OF CORVIDS IN URBAN ENVIRONMENT: APPLICATIONS IN HUMAN-WILDLIFE CONFLICT MANAGEMENT

László Kövér, University of Debrecen; Lajos Juhász, University of Debrecen; Szabolcs Lengyel, Centre for Ecological Research; Petra Paládi, University of Debrecen; Dávid Tóth, University of Debrecen; Norbert Tóth, University of Debrecen

Corvid species have colonised and spread in many European cities in recent decades. They are often considered a pest due to their noise, spilling litter, aggression to humans and domestic animals, and predation on birds of urban environments. Consequently, the control and/or management of crow populations may become necessary in the future in many cities. The aim of this study was to compare the effectiveness of different trap types in catching crows and other corvids in an urban environment. We experimentally tested four types of traps (Larsen: side and upper door versions, Swedish trap and ladder entrance trap) at the campus of the University of Debrecen (Hungary) during the winter season. As bait, we used bread and live decoy birds. During more than 100 trap-days we caught more than 25 Hooded Crows (*Corvus cornix*), almost 250 Rooks (*Corvus frugilegus*), two Jackdaws (*Corvus monedula*) and two Magpies (*Pica pica*). The results showed that the ladder entrance trap and the side-opening Larsen trap were the most effective. We caught only juvenile Hooded Crows, and both juvenile and adult Rooks, likely related to the wariness of adult crows. We had many recaptures and some trap-happiness crows were experienced. Our study suggests that trapping

may be an effective way to catch crows and that some trap types may be more efficient than others. We present detailed guidelines for the construction and operation of these traps, which experience will be important in urban environmental management, and in nature conservation and wildlife management. The other hand is any research proposes relevant to corvids. The crows are really smart, really hard to catch them, the trapping can be a good method for any research reason.

COST-EFFECTIVENESS OF BUYING VS. BORROWING LAND IN A NATURA 2000 SITE IN NORTHERN GERMANY

Oliver Schöttker, Brandenburg University of Technology Cottbus-Senftenberg; Frank Wätzold, Brandenburg University of Technology Cottbus-Senftenberg

Nature conservation agencies face a crucial decision to make at the beginning of every conservation project: is it more cost-effective for agencies to (1) buy areas of interest and implement conservation measures themselves or through closely monitored firms, or (2) offer compensation payments to landowners to incentivize voluntary implementation of conservation measure on their land. We analyse the cost-effectiveness of the buy option compared with the compensation option in a case study, the conservation of an oligotrophic lake in a Natura 2000 area in Schleswig-Holstein, Germany. The project is implemented by the Stiftung Naturschutz Schleswig-Holstein (SNSH), which buys and administratively manages land for grassland conservation. The actual implementation of extensive grassland measures is performed by an external contractor, the Bunde Wischen e.V. (BW). The buy option is compared with the hypothetical costs of implementing an alternative compensation scheme with identical conservation outcome on the same area, causing expenses for compensation payments and transaction costs and potential income from selling agricultural products. Our data resembles data provided by the SNSH and the BW on the actual costs of buying and managing land for the project between 1980 and 2015, as well as extensive third-party literature to estimate the costs of the compensation option. We provide a conceptual framework of costs in either alternative and show that the cost-effectiveness depends on parameters like transaction costs, leasehold conditions and agricultural land prices and conduct a sensitivity analysis to assess the influence of parameters on the cost-effectiveness. We find that the compensation scheme is more cost-effective in the short run, while buying land outperforms in the long run, with a breakeven point in 2004. Among other factors, increases in transaction costs and agricultural land prices are found to predate the breakeven point of both management options.

CREATING ENVIRONMENTAL ENTREPRENEURS: DEVELOPING ALTERNATIVES TO FOREST RESOURCE EXTRACTION

Anne Savage, Disney's Animal Kingdom; Carolina Chinchilla, Fundacion Proyecto Titi; Rosamira Guillen, Fundacion Proyecto Titi

Developing effective conservation programs that positively impact the survival of a species while considering the needs of local communities is of utmost concern when working in areas of high natural resource consumption. Proyecto Tití has integrated local communities in the conservation of Colombia's critically endangered primate, the cotton-top tamarin (*Saguinus oedipus*), by developing programs that reduce the use of forest products and provide an economic incentive for protecting wildlife and forested areas in Colombia. After identifying the collection of firewood as a major threat to cotton-top tamarins, Proyecto Titi developed bindes, a specially designed cook-stoves that use a third less firewood than traditional stoves and Titílena, a specially designed briquette that is an alternative to firewood. Recycling plastic in local communities leads to the creation of new, environmentally friendly businesses. Women received small business management skills and learned how to make eco-mochilas, tote bags crocheted from plastic bags and plush cotton-top tamarin toys. ASOARTESANAS, the local artisan group that has been established, has recycled more than 4 million plastic bags and was awarded the UNDP Equator Prize for their efforts to create a small business that helps to rid their communities of litter and support the conservation of cotton-top tamarins. Community members also collect plastic which is converted into TITIPOSTS, recycled plastic fence posts that are used instead of young trees to create fenced areas. TITIPOSTS protect Proyecto Tití reforestation and restoration efforts and provides opportunities for people around the world to support species conservation through a crowdfunding campaign, "Save a Tree, Save a Tamarin." Evaluations of these programs have demonstrated that community members who participate in these programs are more supportive and engaged with conservation efforts.

CROSSING BOUNDARIES TO SUSTAIN FRESHWATER ECOSYSTEMS, SERVICES, AND VALUES IN AN URBANIZING WORLD

Stephanie Januchowski-Hartley, Laboratoire Evolution et Diversité Biologique, Université Paul Sabatier; Céline Jezequel, Institut de Recherche pour le Développement,

Université Paul Sabatier; Sebastian Martinuzzi, University of Wisconsin Madison; Pablo Tedesco, Institut de Recherche pour le Développement, Université Paul Sabatier

Fresh waters are some of the most heavily modified ecosystems on earth, impacted by diverse human-induced stressors, many of which are associated with urbanization. At the same time, urban centers frequently depend on relatively non-impacted freshwater ecosystems for services such as drinking water. With ongoing global change, including climate change, there is the potential for both threats and opportunities to freshwater resources and the species and communities that depend on these resources. However, complexities and trade-offs between human dependencies and well-belling, and changing land use, climate and associated stressors remain poorly explored for freshwater ecosystems. Increasingly improved data and models allow us to explore alternative scenarios that can be used to inform policy making or management decision making. With this in mind, we present findings, available knowledge, and data gained from recent broad-scale studies in the United States and France that could be brought together or further developed to explore alternative scenarios at varied spatial scales, from individual urban areas to associated catchments. Drawing on these cases, along with knowledge gained from local-scale case studies, we introduce future directions that could be taken to inform cross-scale policy and management decisions. We propose several directions that could be taken by coupling spatial and social sciences with the arts to develop alternative scenarios for fresh waters, and to capture and identify communities' knowledge and values of these systems to guide more informed environmental management, policy, and education programs.

CURBING HARMFUL INTERNATIONAL WILDLIFE TRADE

Collette Adkins, Center for Biological Diversity

The international wildlife trade risks overexploiting rare species, spreading disease and establishing invasive populations. Conservationists have legal tools to address these threats. Although not well known, the United States' 100-year old Lacey Act is a powerful tool to prevent threats of invasive species and disease associated with wildlife trade. The presenter will discuss the recent listings of eight species of constrictor snakes as "injurious" under the Lacey Act, which has resulted in a ban on U.S. imports of the giant snakes, reducing the threat they pose to native wildlife upon escape or release. In addition, conservationists have used the Lacey Act to ban U.S. imports of salamanders to prevent introduction of a deadly fungus known as Bsal (*Batrachochytrium salamandrivorans*). This highly virulent pathogen from Asia is spreading through the salamander pet trade and has nearly wiped out wild fire salamanders in the Netherlands and Belgium. The presenter will also discuss using the U.S. Endangered Species Act, CITES and state laws to address overexploitation of U.S. freshwater turtles for international food, pet and medicinal markets. Characteristics such as delayed sexual maturity, dependence on high adult survival and high natural levels of nest mortality predispose turtles to rapid declines from exploitation. Pangolins are also highly sought by wildlife traffickers with more than one million of the scaly anteaters removed from the wild in the past decade. Conservationists seek to curb this trade by protecting seven pangolin species under the U.S. Endangered Species Act. These seven species deserve protection in their own right and because of their similarity of appearance to the Temminck's ground pangolin from Africa, which already enjoys the Act's protections.

DAMMING FRAGMENTS SPECIES RANGES AND HEIGHTENS FRESHWATER FISH EXTINCTION RISK

Juan Carvajal-Quintero, Institute of Ecology A.C., INECOL; Juliana Delgado, The Nature Conservancy; Stephanie Januchowski-Hartley, Paul Sabatier University; Céline Jézéquel, Muséum National d'Histoire Naturelle; Javier Maldonado-Ocampo, Pontificia Universidad Javeriana; Pablo Tedesco, Université Paul Sabatier Toulouse

Freshwater ecosystems harbor an extraordinary rich and endemic biota, and provide ecosystem goods and services valued at several trillion USD/year. At the same time, strong human dependence on these goods and services is driving increased pressure on theses ecosystems and the species that they support. Across the globe, damming of waterways for hydropower, agriculture and municipal water supplies continues to be a primary pressure on freshwater ecosystems. Nearly two-thirds of the world's largest rivers were fragmented by dams at the start of the century and the remaining proportion of free-flowing rivers is rapidly declining. Despite diverse impacts from dams on freshwater ecosystems, tropical rivers are experiencing an unprecedented boom in dam construction. At the same time, knowledge about the ecology of tropical rivers and the implications of existing and planned dams on freshwater-dependent species remains limited. We evaluated fragmentation of fish species ranges, considering current and planned dams of the Magdalena River basin, Colombia. We quantified the relationship between species range and body size to establish a vulnerability limit set by this relationship. We used the vulnerability limit to explore the influence of range fragmentation on extinction risk of 179 native freshwater fish species in the Magdalena River basin. We

found that both existing and planned dams fragment most fish species ranges, and splits species ranges into more vulnerable populations. Importantly, we found that migratory species, and those that support fisheries, are most affected by fragmentation. In my presentation of this work, I will discuss how our analyses offer a starting point to guide more effective conservation action to reduce impact of expanding dams on freshwater fishes and subsistence fisheries.

DECISION MAKING FOR THE CONSERVATION OF ANDEAN BEARS USING PRESENCE-ABSENCE DATA

Robert Marquez, Wildlife Conservation Society; Guillermo Bianchi, ULA; Isaac Goldstein, Wildlife Conservation Society

The Andean bear is a conservation objective at many protected areas in Colombia, Ecuador, Peru and Bolivia. There is a lack of operational tools to diagnose and implement actions for the effective management and conservation of the species. Moreover, the conservation of the populations at the protected area (PA) level often requires the diagnostic and implementation of interventions beyond the PA limits. To solve the problem, we have been using occupation modeling based on presence-absence data of the Andean bear and the identified threats to develop the framework for the analysis of the conservation state of the Andean bear populations. The occupancy of the Andean bears was analyzed considering two different sample units: 16 km2 and 1 Km2. The analysis at the 16 km2 scale focus on the conservation state of the population assuming a correlation between the occupancy and the abundance of the species. The analysis at the 1km2 scale, focus on the factors (threats and management interventions) that affect the use and in consequence the occupancy of the species. As an example, the occupancy models at the Machu Picchu Historic Sanctuary in Peru and at the Tatamá National Park in Colombia, showed that the presence of cattle was a key factor impacting occupancy. The planning of the control and vigilance activities at the two protected areas were changed based on the occupancy model findings.

DEFINING URBAN: ACHIEVING A COMMON UNDERSTANDING FOR A VARIABLE CONCEPT

Megan Draheim, Virginia Polytechnical University; Lauren Bailey, Society for Conservation Biology

With more than half the world's population now living in cities, and that percentage projected only to increase, there is a growing recognition that conservation biologists should be concerned with urban systems. However, there is not yet a common definition for what "urban" means in the field of conservation biology. Without this, it is hard for researchers and practitioners within the field to compare work, because we are not necessarily starting with the same understanding. It is also difficult to uncover trends, recognize important questions to ask, or predict emerging problems. In an interdisciplinary field such as conservation biology, not having a well-defined understanding of a term with such significant implications for geography, ecology, sociology, and policy, can add another layer of complexity and difficulty to collaborations with colleagues in other fields. Finally, there are other, potentially more dire consequences with respect to research and practice in social and environmental justice: without a clear understanding of, and agreement on what factors and variables constitute "urban," key issues or demographics can be overlooked or altogether left out of the discussion. Because of the above, and in order to advance the field of urban conservation biology, we need to establish a common and precise definition of "urban." Different fields have definitions based on a variety of measurements relevant to their work, including human density, economic indicators, infrastructure, etc.; we need to develop a definition that is relevant to conservation biology. This will help us to work internally within our field and also to communicate that definition to colleagues in other fields. We will explore some of the measurements currently in use, provide suggestions for which might be most relevant to us, and discuss some potential paths forward.

DESIGN OF A RESEARCH INFRASTRUCTURE FOR A TERRESTRIAL ECOLOGICAL OBSERVATORY SYSTEM FOR COLOMBIA

Juan Posada, Universidad del Rosario; Jesús Anaya, Universidad de Medellín; Dolors Armenteras, Universidad Nacional de Colombia; Lina Estupiñán, Instituto de Investigación de Recursos Biológicos Alexander von Humboldt; Catalina González, Universidad de los Andes; Víctor Gutierrez, Temple University; Rodrigo Jiménez, Universidad Nacional de Colombia sede Bogotá; María Londoño, Instituto de Investigación de Recursos Biológicos Alexander von Humboldt; Miguel Mahecha, Max Planck Institute for Biogeochemistry; Germán Poveda, Universidad Nacional de Colombia sede Medellín; Björn Reu, Universidad Industrial de Santander; Carlos Sierra, Max Planck Institute for Biogeochemistry

The recent peace agreement reached between the Colombian government and the rebel group FARC is rapidly changing the country's economic, social and environmental context. Thus, there is a pressing need to understand how Colombia´s mega-biodiversity and

biogeochemical cycles will be affected by these changes. Nevertheless, the current capacity of the country to monitor in near real-time the dynamics of its ecosystems is limited. Improving this condition is a major endeavor that will need support from local and international research, education and state institutions and a system of governance. Here we present the conceptual design of a terrestrial ecological observatory system for Colombia with the aim to increase the capacity of the country to monitor 1) climate and hydrology, 2) biogeochemical cycles, 3) biodiversity, and 4) socio-economic drivers. We outline a research infrastructure required to monitor variables that would allow the country to evaluate the state of its ecosystems as well as to improve its capacity to react to natural and anthropogenic disturbance and deal with drivers of change. The system will take advantage of Earth observations from satellites, incorporating in situ observations and predictive models into near-real time data products of key ecosystem variables. Such a system must also be accompanied by a reference level that describes past ecological change through paleo-ecological studies and data clearing houses for scientists, policy makers, managers, educators, and the general public in a timely manner. Standardization of measurement protocols, sensor calibration and data quality controls will be particularly important. Due to logistical complexities and costs, the research infrastructure will have to be limited to a few key sites based on their ecology, biodiversity and climate. The system is designed for developing countries with high levels of biodiversity, but limited economic resources for scientific research and infrastructure.

DESIGNING POSITIVE BEAR BILE REDUCTION CAMPAIGNS FOR CHINESE TOURISTS

Shannon Randolph, San Diego Zoo Global; Jenny Glikman, Institute for Conservation Research, San Diego Zoo Global; Matt Hunt, Free the Bears; Luke Nicholson, Free the Bears; Sengaloun Vongsay, Free the Bears

Human-centered design is a tool that can be used in conservation research to gather qualitative data on local and indigenous concerns and desires regarding natural resource use and to rapidly test locally appropriate behavior change interventions. In collaboration with Free the Bears, we piloted the utility of human-centered design to engage Chinese tourists at a bear rescue center in Northern Laos. In response to Chinese tourists' concerns and interests regarding bears and the bear parts trade identified during qualitative interviews and observations, we prototyped a series of educational experience interventions inside the rescue center. We then iteratively revised the interventions based on feedback and follow-up observations. Once the human-centered design process has run its full course, we will conduct surveys to test the impact of the interventions on tourists' desired behavior and attitudes towards bears and bear parts use. The goal of this project is to craft culturally appropriate signage and educational experiences for Chinese tourists to sensitize and encourage the use of herbal and pharmaceutical alternatives to bear parts.

DEVELOPING EFFECTIVE TROPICAL DRY FOREST PROTECTION AND RESTORATION PROGRAMS IN COLOMBIA

Juan Barrios, Fundacion Proyecto Titi; Cristal Ange, Fundacion Herencia Ambiental Caribe; Nelson De La Rosa, Santuario de Fauna y Flora Los Colorados; Katie Feilen, Disney's Animals, Science & Environment; Rosamira Guillen, Fundacion Proyecto Titi; Gina Rodriguez, Fundacion Ecosistemas Secos De Colombia; Anne Savage, Disney's Animal Kingdom;

Habitat destruction is one of the largest threats to the long-term survival of cotton-top tamarins (*Saguinus oedipus*), with less than 10% of their original forest habitat remaining. To reverse the decline of this species, Proyecto Titi has developed strategies to protect and reforest tropical dry forests in Colombia. Proyecto Titi has worked with partners to create three protected areas, totaling 1,770 hectares of forests dedicated to the preservation of cotton-top tamarin. With the urgent need to create additional forests to assist with long-term population growth of the species, Proyecto Titi surveyed the remaining habitat for cotton-top tamarins in 2005 and 2012 within the historical distribution and identified Los Colorados Wildlife Reserve as a key habitat for future forest expansion efforts. They developed a restoration and reforestation plan to connect Los Colorados and a newly established reserve (Los Tities Biological Reserve) to other small isolated forest patches in the area. Informed by long-term scientific research on cotton-top tamarins, Proyecto Titi has selected 17 native species that are fast growing pioneer species and important foods and sleeping sites for cotton-top tamarins to be planted in the corridors. Working with 25 farmers that dedicate part of their land to restoration efforts, they will reforest 79 hectares of tropical forests creating important corridors that will allow cotton-top tamarins and other wildlife to safely move through the forest. As part of the program, farmers receive technical training and farming tools to increase the sustainability of their farming and ranching practices. The strategy of protecting and reforesting tropical dry forest will increase available habitat for cotton-top tamarins, an important step for their long-term survivability.

DEVELOPING ROBUST INDICATORS FOR PRIVATE SECTOR CONSERVATION AND NATURAL CAPITAL ACCOUNTING

Fabien Quétier, Biotope; Helen Ding, World Resources Institute; Joël Houdet, Integrated Sustainability Services

Biodiversity is increasingly seen as a material risk by companies, due to stricter legislation and increasing stakeholder pressure. Managing impacts on biodiversity requires them to expand their focus from their direct operations to their supply chains, where raw materials are sourced from a diverse set of suppliers. For new projects, best practice guidance on addressing impacts on biodiversity increasingly refers to achieving 'no net loss' or even 'net gains' for a wide range of biodiversity features. Similarly, 'No Deforestation' commitments are increasingly used in food supply chains. These approaches are grounded on the premise that biodiversity losses and gains can be measured and assigned to a particular intervention. The need for verifiable and repeatable methods for quantifying these effects has become an imperative. Such methods carry the risk of oversimplification, as companies will only manage what they can measure. Alternatively, complexity can be embraced through, e.g., multi-criteria methods and scientifically-tested measurement protocols for prioritized features and their interactions. To illustrate this approach, we examine a tool designed for rapid assessments of wetland functions in the context of impact assessment and mitigation. Finally, we discuss the challenges and opportunities of informing decisions at the corporate level based on data generated at the site or project level. How can such data be compiled, across multiple locations, and made relevant for company management? Also, what does this mean for corporate disclosure on biodiversity? Traditional approaches (e.g., GRI-based reporting, environmental profit and loss accounts) focus only on annual changes and discard the extent and condition of natural capital stocks. Yet, if businesses are to disclose their net impacts on biodiversity, and actively contribute to achieving lasting conservation outcomes on the ground, developing natural capital balance sheets becomes essential.

DEVELOPMENT OF A NATIONAL STRATEGY TO COMBAT WILDLIFE TRAFFICKING: THE PERU EXPERIENCE

Jessica Galvez Durand, Servicio Nacional Forestal y de Fauna Silvestre, SERFOR

The Peruvian government has been advancing its efforts to combat wildlife trafficking. One of the most important is the creation of the Peruvian National Strategy to Combat Illegal Wildlife Trade through a multisectorial process where participated more than 17 governmental and no governmental agencies throughout year 2015. This strategy has three objectives: 1) to educate, disseminate information and raise awareness on the illegal wildlife trade; 2) to strengthen law enforcement through multisectoral coordination in Peru; and 3) to strengthening border control to diminish international wildlife trade in coordination with neighboring countries. It is current implementation in coordination with Regional and National agencies, including bilateral actions.

DIFFERENCES BETWEEN PYGMY AND NON-PYGMY HUNTING IN THE CONGO BASIN

John Fa, Manchester Metropolitan University

Using data on game harvests from 60 Pygmy and non-Pygmy settlements in the Congo Basin forests we examined whether hunting patterns and prey profiles differ between the two hunter groups. We assessed the impact of hunting of both hunter groups from estimates of numbers and biomass of prey species killed per square kilometre, and by examining the proportion of hunted taxa of low, medium and high population growth rates as a measure of their vulnerability to overhunting. We then map harvested biomass of bushmeat by Pygmies and non-Pygmies throughout the Congo Basin. Our results clearly indicate that the two hunter groups use the wildlife resource in different ways and their hunting impact is substantially different. Pygmies take larger and different prey and non-Pygmies sell more for profit. We show that non-Pygmies have a potentially more severe impact on prey populations than Pygmies. This is because non-Pygmies hunt a wider range of species, and twice as many animals are taken per square kilometre. Moreover, in non-Pygmy settlements there was a larger proportion of game taken of low population growth rate. Our harvest map shows that the non-Pygmy population may be responsible for 27 times more animals harvested than the Pygmy population. Such differences indicate that the intense competition that may arise from the more widespread commercial hunting by non-Pygmies is a far more important constraint and source of conflict than are protected areas. This trend is only likely to worsen as rural to urban migration drives the incentive for commercial hunting to meet demand for bushmeat in urban centres.

DIFFERENTIAL EFFECTS OF NATIVE AND EXOTIC PLANTATION ON BIRD DIVERSITY: A GLOBAL ASSESSMENT

Gabriel Castaño, Universidad de Caldas; Jaime Estevez, Universidad de Caldas; Francisco Fonturbel, Pontificia Universidad Catolica De Valparaiso; Giovany Guevara, Universidad del Tolima

Planted forests are becoming increasingly common worldwide. However, the debate about their role as habitat for birds is still open. In this regard, native species plantations have been recently acknowledged as more bird-friendly, but this issue is still scarce in the literature. We conducted a meta-analysis with the available literature to determine if forest plantations have an effect on bird richness and abundance, and if such effect is consistent between native and exotic plantations, and between tropical and temperate habitats. Our survey provided 76 case studies, showing that both richness and abundance were lower in forest plantations compared to native forests. Regarding plantation type, we found negative effects of exotic ones on the richness and abundance, but there was no effect of native plantations on both variables. The effects on species richness were consistent at tropical and temperate habitats, whereas only the abundance was significant for temperate habitats. These results suggest that native plantations are more bird-friendly as reported by some studies, and despite they do not replace native forests may have a positive impact on bird conservation. Our knowledge about native plantations is still scarce, but our results suggest that they may constitute habitat for many bird species and its study should be a global priority.

DISPARITIES IN PRIMATE VULNERABILITY TO HUNTING AND IMPLICATIONS FOR MANAGERS

Lauren Wilson, Rutgers University

The majority of primate species are targeted for use by humans (bushmeat consumption, pet trade, folk medicine use, etc.). While certain species of primates can be lawfully hunted in some countries, illicit hunting (poaching) threatens many protected species. Because of the criminal nature of these acts, findings from the field of environmental criminology—which focuses on the immediate situation (environment) in which crime events occur—should be applied. The theory, analytical methods, and prevention-oriented nature from this field may prove useful for natural resource management, as it relates to poaching. Because primate poaching has not been examined through the lens of criminology, I aim to establish basic assumptions on primate biology and human behavior from which the criminological approach may proceed. First, I examined the relationships between known primate threats and IUCN conservation status and population trend. Findings from these analyses guide current work, presented here, examining whether and how primate characteristics encourage bushmeat hunting, specifically, characteristics that place some species at greater risk for detection and hunting. For example, phenotypic features such as body size, vocalization, or locomotion may make individuals of some species more conspicuous (detectable) or geographic factors such as range overlap with regions of high malnutrition rates for humans may drive consumption of larger-bodied species. Comparing primate-targeting patterns in the parallel situations of legal hunting and poaching may also elucidate whether hunters and poachers exhibit similar decision-making processes. By understanding the poacher decision-making process, environmental criminologists can develop management schemes that exploit "pinch points" in the process, making the poacher's risk greater and reward lower.

DISSECTING WIN-WINS THROUGH THE REINTERPRETATION OF PES 'SUCCESS' STORIES IN NICARAGUA

Gert Van Hecken, University of Antwerp

As Payments for Ecosystem Services (PES) continues to gain attention as a policy tool for securing efficient and effective environmental governance, a rising tide of criticism warns of the potentially detrimental social–ecological consequences of nature commodification and 'green neoliberalism'. These concerns are also expressed at international policy fora, where the market rhetoric has met with political resistance from countries belonging to the 'Bolivarian Alliance for the Peoples of Our America' (ALBA). But despite this ideological opposition, some ALBA countries are increasingly integrating PES into their environmental policies. In this article we consider the reasons underlying this apparent contradiction and relate it to the notion of 'epistemic circulation'. On the basis of a study on the evolution of PES-thinking in Nicaragua (an ALBA member) and a reassessment of the supposed 'success' of an influential pilot project, we shed light on the forces driving the adoption of particular PES modes and contextualise practical difficulties to endorsing more critical approaches to the tool. Instead of either ideologically rejecting PES as a neoliberal evil or embracing it uncritically as the new panacea, we argue that it is precisely through the socio-political processes surrounding environmental governance debates that the application of PES is shaped. In practice, it may either contribute to an imposed and dispossessing form of capitalism, or tend towards a more negotiated and socio-culturally embedded version of it. Only through its reconceptualisation based on political–cultural primacy rather than market-fetishism can PES achieve its true potential within a broader strategy towards improved environmental governance.

DIVERSITY, FUNCTION AND ECOSYSTEM SERVICES PROVIDED BY CONSERVATION AREAS IN LATIN AMERICAN CITIES

Francisco Escobedo, Universidad del Rosario- Facultad de Ciencias Naturales y Matemáticas

Of the ten countries with the highest biological diversity, five are in Latin America (LA). Paradoxically, LA is the world's most urbanized region with about 80% of its population living in cities. Although rich in biological diversity it is also characterized by marked socio-economic inequalities. Despite this realism, non-governmental, government, and research organizations throughout the region are providing examples of how conserved green spaces, forests, wetlands and peri-urban natural areas are improving the quality of life of urban Latin Americans. I will present several science-based programs, case studies, and guidelines that are providing ways forward for promoting and advocating the context-specific ecological, socio-economic, and environmental benefits provided via the conservation and proper management of these areas in and near LA cities. First, I will discuss how studies of temporal socio-ecological changes in Puerto Rican Urban forests can be used to understand the supply of relevant ecosystem services. Second, I will provide examples of how remnant peri-urban forests in Mexico are both reservoirs of biodiversity and air pollution sinks. Third, case studies from Colombia will present how research-management of public green spaces can be used to address issues of climate change and environmental justice. Also from Chile and Argentina, examples are provided of how researchers, the community and policymakers developed management and planning guidelines for addressing pollution and food security issues. The presentation will finalize by showing how these, and other international experiences, have been used develop guidelines, incorporate citizen science, and improve human well-being; while conserving biodiversity.

DOES GREATER SAGE-GROUSE HABITAT QUALITY INCREASE LIKELIHOOD OF LEK EXTIRPATION?

Beth Fitzpatrick, University of Wyoming; Melanie Murphy, University of Wyoming

Research focusing on functional connectivity of declining populations would benefit conservation planning for long term species persistence. Functional connectivity, as measured by gene flow, can identify landscape characteristics that are corridors or barriers. Greater Sage-grouse (*Centrocercus urophasianus*) are experiencing population declines and habitat loss in association with anthropogenic disturbance. Patterns of landscape change and population decline is variable over their distribution. By comparing two areas of differing amount of land conversion, Northeast Wyoming and north central Wyoming, we intend to test the influence of habitat quality and functional connectivity on lek extirpation using microsatellite data. We tested isolation by distance using a mantel's test with randomization and found a stronger isolation by distance pattern in Northeastern Wyoming (observed compared to zero = 0.12; p=0.001) than northcentral Wyoming (observed = 0.06; p=0.003). Mantel's correlogram suggest a longer dispersal distance in the northeast Wyoming. Cluster analysis show more genetic clusters in the regions with more development (K=5 versus K=2). Network modelling supported increased gene flow associated with undisturbed areas of contiguous habitat and negatively associated with disturbance. Sagebrush loss due to development has the potential to isolate or create an effective barrier between leks. Increase in dispersal distance, reduced gene flow and increased genetic structure may suggest reduced habitat quality and an increased likely hood of lek extirpation. Landscape planning could benefit from using this information to inform conservation and restoration of sagebrush habitat for the benefit of sage-grouse. Furthermore, information on landscape characteristic leading to breeding site extirpations can lead to restoration and conservation practices that are focused on the sustaining wildlife populations.

DOES THE U.S. ENDANGERED SPECIES ACT BENEFIT NEOTROPICAL MIGRANTS?

Loyal Mehrhoff, Center for Biological Diversity

The U.S. Endangered Species Act provides a robust suite of protections for threatened and endangered species. For species in the U.S., these protections include prohibitions on the intentional and incidental killing, sale, or harm of species, restrictions on federal agencies from pushing species towards extinction, the identification of habitats critical to the survival and recovery of listed species, and the establishment of planning efforts and funding to foster the recovery of threatened and endangered species. Species outside of the U.S. have far fewer protections, with the primary benefits being restrictions on the importation of protected species and a mechanism to establish voluntary cooperative conservation efforts. Recent studies have shown that of the 93 threatened and endangered North American bird species for which population trends could be determined; 71 percent of birds increased after listing, 13 percent were stable, and 15 percent declined. This contrasts with data on 209 unlisted North American birds that showed only 39 percent increased, while 17 percent were stable and 44 percent declined in numbers. We looked deeper into these

data to see if this pattern held for Neotropical migrants, species which spend part of their year in North America and part in Central or South America. All but one of the 17 threatened or endangered North American birds that are Neotropical migrants have increased in population size since being protected under the Endangered Species Act (91 percent). The 128 unlisted Neotropical migrants showed patterns similar to unlisted North American birds in general, with 41 percent having increased, 16 percent stable, and 43 percent having declined. These results indicate that at least for birds that spend part of their time in the U.S., the benefits provided by the Endangered Species Act may be very important, even if those species are reliant on areas outside of the U.S. and, thus, outside most of the protections of the Act.

DOING CONSERVATION DIFFERENTLY

Rebecca Jarvis, Institute for Applied Ecology New Zealand, Auckland University of Technology; Barbara Bollard Breen, Auckland University of Technology

Conservation science is often described as a mission-driven discipline. Yet too few conservation initiatives deliver impact. This is because conservation is complex, the problems are wicked, and the solutions are far from simple. As a result, there is a growing recognition amongst conservation researchers and practitioners that we need to embrace the messiness and uncertainty of conservation. To do this, we need to better understand how to navigate the spaces between science, policy, and practice, and identify new pathways to deliver change. Drawing from case studies from Madagascar, New Zealand, and Antarctica, this talk will illustrate the messiness of conservation, the complexity of engaging with policy, and some of the lessons we have learned along the way. We will also talk about the characteristics we conservationists should aim to cultivate in ourselves – such as curiosity, empathy, and openness to a diversity of viewpoints – if we want to overcome the barriers to achieving successful conservation outcomes. If conservation is a truly mission-driven discipline, we must do more than observe and interpret the world around us, we must also change it. We must do conservation differently.

DRIVERS OF COMPOSITIONAL CHANGES IN HUNTED CENTRAL AFRICAN VERTEBRATES

Daniel Ingram, University of Sussex; Lauren Coad, University of Sussex

The overexploitation of wildlife has recently been identified as the main pressure threatening wildlife, driving population declines and extinctions. Overexploitation not only represents a major challenge for wildlife, but also for the people that rely on wildlife for food and livelihood. Therefore, understanding the quantities of wildlife harvested, the drivers underlying hunting pressure, and changes in the compositions of wildlife harvests is important to safeguard both wildlife and people. To tackle this challenge, we collate and analyse local-scale studies together, to reveal continent-wide trends to inform conservation policy and action. We collated available quantitative data from published studies investigating the vertebrates hunted across Africa. Using linear mixed effects models, we highlight changes in the composition of hunted vertebrates over time. In particular, we found that the number of pangolins hunted has increased after the year 2000, and show that the pangolins as a proportion of all vertebrates hunted has increased between 1972 and 2014 across Africa. We also find that the accessibility of the site to humans drives compositional changes, for example rodents make up a greater proportion of what is caught in the most accessible areas, providing evidence for depletion zones near human settlements at a landscape scale. We also found significant trends in the composition harvested over an accessibility gradient by investigating the average body mass of birds and mammals harvested across sites. Here, we analyse broad-scale quantitative data to understand the temporal and spatial patterns of the hunting of African wildlife to help guide conservation decisions to reduce exploitation and trade of threatened vertebrates.

DRIVING THE NEED FOR CONSERVATION TRANSLOCATIONS

Typhenn Brichieri-Colombi, Centre for Conservation Research, Calgary Zoological Society; Axel Moehrenschlager, Centre for Conservation Research, Calgary Zoological Society

In a world where conservation translocations are increasingly used to moderate the human effects on biodiversity, understanding the goals and motivations behind these strategies is important to ensure their proper implementation. Focusing on North America, we recently extracted information on motivations, funding sources, obstacles and success evaluation criteria from publications on conservation translocation efforts in the United States, Canada, Mexico, Central America, and Caribbean. The projects were identified via a systematic search of the ISI Web of Knowledge and Academic Search Complete databases that yielded 1863 relevant articles published between 1974 and 2013. Additional information on motivations, funding sources, obstacles and success evaluation were gleaned via an online survey of 330 authors. Our analyses suggest that non-biological factors, including national and sub-national political priorities and

financial constraints are important in shaping translocation efforts. We also found that factors considered during the selection of release sites and criteria to evaluate success did not optimally reflect common obstacles and goals, respectively. This suggests that there is room to further increase the efficacy of translocation projects.

ECOSYSTEM CONCEPTUAL MODELS AT MULTIPLE SPATIAL SCALES HELP PIECE TOGETHER THE BIODIVERSITY PUZZLE

Eren Turak, NSW Office of Environment and Heritage; Tom Barrett, Office of Environment and Heritage; Michael Drielsma, NSW Office of Environment and Heritage; Jan Miller, NSW Office of Environment and Heritage; Emily Nicholson, Deakin University; Nathalie Pettorelli, Institute of Zoology, ZSL; Mal Ridges, NSW Office of Environment and Heritage; Peter Scanes, NSW Office of Environment and Heritage; Dirk Schmeller, Helmholtz Center for Environmental Research; Tricia Waters, Gondwana Rainforests of Australia World Heritage Area

Recent approaches for measuring system level changes in biodiversity and for identifying ecosystems at-risk, rely on the development conceptual models of ecosystems. In addition to representing natural dynamics, these models can serve to show how appropriate management and policy Responses may reduce Pressures on Biodiversity, lead to the improvement of the Sate of Biodiversity and greater Benefits (RPSB). This cause and effect relationship between management actions and biodiversity condition is likely to depend on spatial scale. We developed conceptual models at three spatial scales for natural assets for which the main government conservation agency has direct regulatory or management responsibility: 1) A World Heritage Area designated to protect temperate rainforests; 2) A large estuary, 3) Alpine streams within a protected area subject to multiple disturbances, 4) A large floodplain Complex which is a Ramsar site, and 5) Semi-arid shrublands within a protected area where a 10 year program is underway to reintroduce locally extinct mammal species. For each of these assets we identified three different spatial scales at which the agency has influence on management and policy. Based on the conceptual models we separately identified variables that must be monitored to best measure the success of management actions and policies. We found, indeed, that the variables prioritised for monitoring, and the cause-effect relationships represented by conceptual models, varied greatly between three spatial scales. Using the models developed for all three spatial scales together would help optimising the benefits of conservations actions and designing efficient biodiversity monitoring programs. Using such hierarchically nested consistently in different terrestrial, marine and freshwater ecoregions of the world would help comparisons between country scale assessments of biodiversity and aggregation of these to track biodiversity change at continental and global scales.

EFFECTIVE DISPERSAL OF CARIBBEAN REEF FISH IS SMALLER THAN CURRENT SPACING AMONG MPAS

Diana Beltran Rodriguez, University of Puerto Rico; Richard Appeldoorn, University of Puerto Rico; Carlos Prada, STRI; Nickolaos Schizas, University of Puerto Rico

Coral reefs are deteriorating at a fast pace. Conservation measures, such as Marine Protected Areas, have been implemented to relieve some areas from local stressors and allow populations to restore to natural levels. Successful networks of MPAs can operate if the space among MPAs is smaller than the dispersal capacity of the species under protection. Here we tested the power of genome-wide Single Nucleotide Polymorphism data to estimate connectivity across populations in a series of MPAs around Puerto Rico and contrasted with 18 microsatellite markers. We found that in the common yellowhead Jawfish, Opistognathus aurifrons the maximum effective dispersal is 10 km. MPAs exchange migrants likely via intermediate available unprotected habitats through stepping stone dispersal. At scales > 100 km such connectivity is decreased, after the Mona Passage, making the Dominican Republic a genetic mosaic of the genetic variation from the eastern and western Caribbean. The MPA network studied is unable to maintain adequate levels of connectivity of these small benthic fishes if habitat in between them is extirpated. Given that overall reef fish diversity is driven by species with life histories similar to that of the yellowhead jawfish, managers face a challenge to develop strategies that allow connectivity and avoid isolation of populations and their extinction.

EFFECTIVENESS OF INDICATORS FOR MONITORING ECOLOGICAL INTEGRITY OF CORAL REEFS IN THE MEXICAN CARIBBEAN

Melanie Kolb, Instituto de Geografía, Universidad Nacional Autónoma de México; Diana Carrillo, Facultad de Ciencias, Universidad Nacional Autónoma de México

The coral reefs of the Mexican Caribbean harbor an important share of marine biodiversity, both nationally and internationally and provide a large array of ecosystem services to society. After decades of degradation and the general awareness of the need to monitor the condition of these ecosystems, no standardized monitoring protocol has been implemented in Mexico and fundamental information for their management and conservation are

lacking. Since reef monitoring is requiring a considerable amount of resources, both human and financial, it is important to assure that this is done in an efficient manner to minimize costs and maximize information derived from data to comply with the monitoring objective. In this study, we reviewed 11 monitoring protocols to see what parameters they gather for generating which indicators. In a second step, we evaluate the ecological relevance of the 64 indicators proposed by the different protocols. Finally, we propose an indicator framework of ecological integrity, compatible with the framework for terrestrial ecosystems and select the most effective indicators for each component of ecological integrity. This evaluation forms part of a broader national scale initiative to enter the next phase of constructing a science-policy bridge by establishing inter-institutional biodiversity monitoring systems, which feed into new and already established collaborations between the National Commission for the Knowledge and Use of Biodiversity (CONABIO) and several government sectors.

END-USERS OF KBA DATA: THE KBA CONSULTATIVE FORUM

Daniela Raik, Conservation International

KBA end-users include donors and conservation planning agencies that use KBAs to guide their investments and priority setting, financial institutions that incorporate KBAs into their safeguard criteria, and private companies that incorporate KBA Data in their mitigation hierarchy analysis, among others. The KBA Consultative Forum is a platform for these end users to provide input to and receive feedback from this group of end-users on the use and application of KBA Data and the KBA Website, as well as management decisions, marketing, funding, etc. of the KBA Programme. During this session, the by which the KBA Consultative Forum is being developed will be described.

ENGAGING WITH BUSINESS TO REVOLUTIONIZE BIODIVERSITY CONSERVATION

Prue Addison, University of Oxford; Joseph Bull, University of Copenhagen - KU; E.J. Milner-Gulland, University of Oxford

As biodiversity declines around the globe, and the human footprint upon nature continues to expand, the global conservation community needs additional partners to help address critical shortfalls in conservation efforts. Engaging better with businesses – potentially powerful new partners, many of whom are already making commitments to sustainable development – may provide the impetus needed for the required step-change in conservation efforts that are currently severely under-resourced. We illustrate how big businesses – the top 2016 Fortune 500 Global companies – are accounting for their impacts on biodiversity through their corporate social responsibility (CSR) disclosure. Businesses are just beginning to incorporate biodiversity into their business models, and as a result much more can be done to strengthen business goals and targets for biodiversity. Enormous opportunities exist for conservation scientists to work with businesses to help strengthen their commitments to biodiversity conservation to begin to create positive outcomes for nature. We outline a model of Knowledge Exchange being employed to engage and collaborate with businesses; helping businesses address some of their key challenges around how to benefit biodiversity through their corporate strategies and day-to-day operations.

ENVIRONMENTAL CO-BENEFITS OF HABITAT CONSERVATION FOR ANDEAN BEARS

Nina Morrell, University of British Columbia; Robyn Appleton, Spectacled Bear Conservation Society; Peter Arcese, University of British Columbia; Richard Schuster, University of British Columbia

Declines in large-bodied vertebrates are wide-spread globally and often linked to human disturbance, habitat loss and fragmentation. However, it remains challenging to develop conservation plans to enhance the persistence of terrestrial vertebrates over their entire range when they have the potential to interact negatively with humans, leading to trade-offs between conservation values and human well-being. It is therefore imperative to find opportunities to conserve habitats likely to maximize the persistence of at-risk species while simultaneously minimizing impacts on human well-being. We explored approaches to range-wide planning for Andean bears (*Tremarctos ornatus*), a flagship species of the Andes of Central and South America. We first used Marxan prioritization software to quantify complementarity between the putative range of Andean bears and co-occurring species using IUCN data on mammal, bird, plant and butterfly species distribution in the region, and the known winter distributions of neo-tropical migrant birds. Second, we used camera trap data and published results to a) estimate the influence of roads, agricultural habitat, and habitat usage to refine an existing range map; and b) ask what areas not already under protection might represent opportunities to use bears as an umbrella of the conservation of South American endemic and North American neo-tropical migrant species. An overarching goal of our work was to provide an open-access, spatial planning tool to assess complementarity between Andean bears, water provisioning services of catchment areas of

the Northern Andes, and biodiversity conservation. We demonstrate the application of the resulting Marxan tool in addressing a variety of spatial planning questions with the potential to facilitate range-wide planning in support of Andean bears.

EVALUATING CONSERVATION OUTCOMES: CAN WE DEVELOP A STANDARDIZED APPROACH FOR MEASURING 'SUCCESS'?

Jeremy Brooks, The Ohio State University

As a result of the interwoven objectives of environmental conservation, economic development, and social justice, conservation projects must serve diverse sets of stakeholders and achieve multiple objectives at multiple scales. That conservation approaches are often expected to promote the welfare and cooperation of local peoples, actively involve local communities, alleviate poverty, and provide other economic and social benefits has been a positive development. However, this list of objectives makes evaluating conservation projects challenging. Comprehensively evaluating conservation projects across space and time requires an equally long and diverse set of measures. With this talk, I will outline the complexity of measuring conservation 'success' by drawing on a global comparative database of 136 community-based conservation projects identified by systematic literature review that is supplemented with recent scholarship on conservation outcomes. I will use this literature review and accompanying dataset to (i) present a set of outcome domains and specific indicators that have been used to evaluate conservation projects, (ii) examine the quality of the research on conservation outcomes and the challenges of evaluating conservation projects, and (iii) highlight potential tradeoffs and synergies within and among outcome domains and the importance of examining relationships among conservation outcomes at multiple spatial and temporal scales. I will use this information to present a preliminary framework for guiding the process of appropriately defining 'success' in a given context and for developing a comprehensive, flexible, and practical set of indicators with a particular emphasis on tradeoffs and synergies. Such a framework could alleviate problems with prioritizing outcomes to serve of interests of a narrow set of stakeholders. Importantly, the framework is not meant to be definitive but is instead meant to seed discussion among panelists and the audience.

EVALUATING POACHING INTERVENTIONS IN THE CONGO BASIN THROUGH THE SITUATIONAL CRIME PREVENTION LENS

Julie Viollaz, Rutgers Center for Conservation Criminology; John Waugh, Integra LLC

A major threat to biodiversity in the Democratic Republic of Congo and Republic of Congo is defaunation due to over-hunting and illegal hunting or poaching. Hunting can be divided into market hunting, in areas with easy access to export routes where hunters sell their meat or wildlife products to traffickers for urban markets, and areas where hunting is primarily for subsistence. This research will evaluate the interventions put in place to address illegal hunting in several conservation landscapes through the situational crime prevention framework. It will deconstruct the interventions being deployed to increase the risks and reduce the rewards for hunting. These interventions include incentives such as alternative livelihoods and alternative protein sources, social and behavioral change communication, and deterrence through improved law enforcement in protected areas. The primary methodology will be key informant interviews and focus group discussions with implementers of conservation projects and intended community beneficiaries of the projects. Recommendations will be provided on how to refine these interventions using crime prevention principles.

EVALUATING THE EFFECTIVENESS OF EFFORTS TO COMBAT THE ILLEGAL WILDLIFE TRADE

Hannah O'Kelly, Independent; Simon Hedges, Wildlife Conservation Society

Efforts to combat the illegal wildlife trade (IWT) typically concentrate on three points in the trade chain: anti-poaching actions to protect key wildlife populations in source countries; anti-trafficking actions in source, transit, and consumer countries; and actions to prevent illegal (or all) sales of, and reduce demand for, wildlife and wildlife parts and products in consumer countries. Assessing the effectiveness of these actions is a significant challenge and the efficacy of many interventions to date remains poorly known. Methods for reliably assessing successes and failures need to be implemented more widely and consistently or, in some cases, developed. Particularly pressing challenges include: (1) a lack of appropriate baselines (e.g. population sizes, poaching rates, or levels of demand); (2) the issue of imperfect detectability (e.g. the proportion of unrecorded animals killed by poachers or assessing the number of items for sale in markets, both physical and virtual) and how this may vary in response to the specific nature of the data collection process and other factors; (3) spatial and temporal scale problems

with sampling designs (e.g., when assessing poaching rates, rates of trafficking, or changes in demand, and how these respond to multi-scale interventions); and (4) attribution problems, e.g., with many simultaneous interventions aimed at reducing demand how can causal linkages be established between specific interventions and any apparent changes in demand? To address these and other challenges, we present a unifying framework that shows: (1) which of the key problems apply at each stage in the trade chain; (2) how the problems differ in severity depending both on the stage in the chain at which they occur and other factors, especially the spatial scale; and (3) the existing (but often under-utilised) solutions to the problems as well as the remaining gaps which require further conceptual development and empirical validation.

EVALUATING THE IMPACT OF CONSERVATION EDUCATION PROGRAMS ON KNOWLEDGE, ATTITUDES, AND BEHAVIORS

Johanna Vega Abello, Fundación Proyecto Tití; Leysthen Díaz, Fundación Proyecto Tití; Katie Feilen, Disney's Animals, Science and Environment; Rosamira Guillen, Fundación Proyecto Tití; Johana Pasion, Fundación Proyecto Tití; Anne Savage, Disney's Animal Kingdom; Katherine Torregroza, Fundación Proyecto Tití

Changing the actions and behaviors of local people living near threatened ecosystems often involves public awareness campaigns and education programs. Proyecto Tití uses cotton-top tamarins as the flagship species for conservation by increasing children's knowledge and understanding of the threats to cotton-top tamarin (ctt) survival, generating attitudes and behaviors that support conservation, and providing opportunities to develop the future generation of conservation leaders in Colombia. Our initial studies found that students didn't understand the difference between domesticated and wild animals and had limited understanding of the impacts of having a wild animal as a pet. We developed TITÍKIDS for students in 4th-5th grade as a means of engaging students in actions that limit the use of wild animals as pets. Continuing our efforts to increase conservation literacy and knowledge, we developed CARTITILLA for students in grades 7th-9th. Using workbooks filled with activities and interactive lessons CARTITILLA was a designed to increase students' knowledge of ctt and understand the factors threatening their survival. We analyzed the results of 742 students who participated in TITÍKIDS and 4,500 students who participated in CARTITILLA. Students who participated in TITÍKIDS significantly increased their ability to identify and classify wild and domestic animals and improved their understanding of why wild animals don't make good pets ($p<0.01$). Students in CARTITILLA significantly increased their knowledge of ctt ($p<0.01$), the threats to ctt ($p<0.01$), and ways students can help conservation efforts ($p<0.01$). Students that participated in CARTITILLA were evaluated 5 years after the program; students had maintained their knowledge of ctt and had pro-conservation attitudes and behaviors. Education and awareness programs increase knowledge, attitudes, and behaviors of students that support the conservation of ctt and other endangered species.

EVALUATING THE RELATIONSHIP BETWEEN THE LEGAL AND ILLEGAL WILDLIFE TRADE

Derek Tittensor, UNEP-WCMC; Gregory Britten, University of California Irvine; Neil Burgess, UNEP-WCMC; Mike Harfoot, UNEP-WCMC; Katalin Kecse-Nagy, TRAFFIC International; Kelly Malsch, UNEP-WCMC; Claire McLardy, UNEP-WCMC; Willow Outhwaite, TRAFFIC International; Becky Price, UNEP-WCMC; Fiona Underwood, Statistical Services Centre, University of Reading

The illegal wildlife trade is a tangible but difficult to quantify pressure on threatened and endangered species. Although many species and populations at risk are listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), a policy mechanism to ensure the sustainability of the international legal wildlife trade, there is sufficient demand for some species products to drive a criminal market estimated to be worth $5-$20 billion. Such additional impacts may have potentially severe consequences for affected populations. While there have been qualitative overviews and quantitative analyses of specific illegal wildlife trade products, such as ivory, and specific markets, there is a lack an understanding of the bigger picture, in particular how - or whether - the quantity of illegal trade relates to levels of legal trade. For this analysis, we combine CITES trade data on legal trade with law-enforcement information on border seizures of illegal wildlife goods conducted by EU member States or the US, to shed light on the relationship between the legal and illegal trade. Assembling and analyzing these data provides an opportunity to determine whether it is feasible to use seizures data to understand how illegal trade changes over time and whether this can be tracked by changes in legal trade. Our findings also suggest the importance of long-term records of border seizures together with measures of reporting and enforcement effort in enabling such studies.

EVALUATION OF DRIVERS AND IMPACTS ON WILDMEAT CONSUMPTION IN COASTAL GUYANA SOUTH AMERICA

Anupana Puran

This study investigated wildmeat consumption patterns and drivers along the urban coastal zone in Guyana, South America. While the majority of the interviewees (62%) consumed wildmeat, the dietary proportion was low, reportedly due to limited availability and high prices. We detected an effect of job sector and location on wildmeat consumption probability and frequency. Among the top five species listed, Tayassu pecari and potentially Odocoileus virginianus are of conservation concern. An estimated 373 tons of wildmeat is consumed annually on the coast. While Guyana maintains extensive tracts of natural habitat, our results indicate concerns regarding the sustainability of commercial availability of wildmeat, particularly considering further development of the hinterland. The bulk of meat consumed along the urban coast is harvested from the hinterland with its mining, logging and related hunting, and where indigenous people continue to depend upon subsistence use of wildlife. Results also indicated that with planned road upgrade wildmeat harvest would increase. Currently, limited legislation and absence of enforcement result in unrestricted hunting. The status of harvested species in Guyana is unknown, and our estimated harvest rates are likely underestimated. Furthermore, lack of species knowledge and conservation awareness renders differentiation between potentially threatened and non-threatened species difficult also limiting our current capability of accessing sustainability of wildmeat. Under these conditions, wildmeat consumption would best be restricted to personal use until clear species restrictions, rigorous hunting regulations and enforcement can be applied. In the long-term, we recommend a culture changes through awareness for urban areas to avoid further conflict with subsistence lifestyle of indigenous groups, which in turn will have to develop management plans to maintain their traditions.

EVALUATION OF TERRESTRIAL ECOSYSTEMS IN CHILE ACCORDING TO THE IUCN RED LIST OF ECOSYSTEMS

Patricio Pliscoff, Universidad Católica de Chile

The Red List of Ecosystems (RLE) of the International Union for Conservation of Nature (IUCN) is an effort on a global scale for assessing the status of ecosystems. Using the concept of risk of collapse, in a similar was to the extinction risk for species, the protocol seeks to assess the current status of ecosystems to local, regional and global scales. An evaluation exercise at the national level is presented, focused exclusively on terrestrial ecosystems. As a definition of ecosystem classification of physiognomic-floristic vegetation is used, which allows an analysis for the whole country in a detailed spatial scale. In addition, the ecosystem classification applying the vegetation potential concept, allowing to use the classification scheme as a definition of the historical vegetation of the country before the anthropogenic impact. The results show the application of three criteria for risk assessment, identifying eight terrestrial ecosystems as Critically Endangered (CR), six Endangered (EN), fourth-nine Vulnerable (VU), five Near Threatened (NT) and fifty-nine with least concern (LC). The results from this exercise, intended to encourage the use of this methodology of risk assessment in different types of ecosystems at similar spatial scales, in order that becomes a standard for risk assessment and threat status of ecosystems in Chile.

EVIDENCE-BASED CONSERVATION PLANNING AND THE MULTIPLE ROLES OF ACADEMIA

Eduardo Silva-Rodriguez, Departamento de Ecología y Biodiversidad, Universidad Andres Bello, Chile; Lyn Branch, Department of Wildlife Ecology & Conservation, University of Florida

The conservation planning process and academic research on conservation-relevant topics still are largely separate endeavors. Although substantial challenges exist to bring these processes together, both could substantially benefit from collaboration. Conservation planning needs information produced from rigorous research. However, access to information is complex because of copyright policies, language barriers, and time available for finding this information. Also, the fact that articles are written for an international audience often leads to the loss of contextual information that is locally relevant and may be key to connect research to practice. To help fill this gap, conservation journals should request articles to be accompanied by a locally useful summary written in the native language. In addition, conservation researchers can be more actively involved in the adaptive management cycle. Academic involvement in participatory stages is fundamental to ensure that research results are available to planning staff. More extensive collaboration would benefit both parties during monitoring. Academics can provide skills in research design and data analysis needed by managers, and academics can benefit from having access to long-term datasets produced with monitoring that are hard to achieve with traditional funding schemes. However, reaching this stage requires understanding from the scientific community regarding the reality of managers and vice versa. Scientists need to be aware of the strong resource limitations of conservation agencies, the technical capabilities of field teams, and the rationale behind the indicators that will be monitored. This understanding comes from the participation of scientists in planning. Finally, we highlight that academia is not only research,

but also teaching. If conservation professors get involved in conservation practice, then we could realistically expect them to provide adequate training for future practitioners.

EXAMINING 'SUCCESS' IN WATER FUND CONSERVATION ARRANGEMENTS IN ECUADOR'S ANDES

Audrey Joslin, Kansas State University

In 2000, Ecuador's growing capital city, Quito, initiated a program for watershed conservation that has since become the model for similar programs throughout Latin America. The foundational concept of the watershed program is that urban water users pay for the conservation of the ecosystems that produce the hydrological services responsible for the quality and quantity of water flowing to the city. Water users in Quito, a mixed assortment of public and private companies, pay into a trust fund called Fondo del Agua (FONAG). This fund generates interest, which then goes towards creating development projects in rural communities that agree to engage in conservation practices requiring the input of labor and the re-arrangement of land uses. This arrangement intends that Quito, and rural communities will benefit through conserving vulnerable ecosystems. Influential players in international conservation, including The Nature Conservancy and the United States Agency for International Development, have declared FONAG as 'win-win' conservation scenario and have pushed for spreading it elsewhere. However, very little research exists on the outcomes of this program's interaction with rural communities. Using FONAG as an empirical case study, this paper examines the interaction of FONAG projects within three rural communities. It uses data from key participant observation, interviews, archival documents, and walking tours to present a framework for evaluating the influence of the program on conservation and development practices within communities. This paper examines the input of labor as key in producing value for this arrangement to function. It demonstrates that 'success' is often claimed through capitalizing on pre-existing land use and labor practices, and that the true 'work' of the program reaches far beyond the ecosystem.

EXPANDING CONSERVATION MONITORING, EVALUATION AND LEARNING TOOLS TO EMBRACE COMPLEXITY

Shauna Mahajan, World Wildlife Fund; Gabriella Ahmadia, World Wildlife Fund; Emily Darling, Wildlife Conservation Society; Helen Fox, National Geographic Society; Louise Glew, World Wildlife Fund-U.S.; Michael Mascia, Conservation International; Katherine McElhinny, Rare; Madeleine McKinnon, Conservation International; David Wilkie, Wildlife Conservation Society

As conservation adapts to our globalized world, tools for monitoring, evaluation and learning (MEL) must evolve to account for the increasingly complex nature of conservation interventions, as well as the dynamic relationships between humans and the environment. We argue that a plurality of tools exists in both conservation science and practice, and that insights from the social-ecological systems (SES) perspective can shape the evolution of current MEL tools. SES approaches can help MEL be more sensitive to non-linear change, uncertainty, and complexity, while still providing relevant insight into nature of causal relationships between conservation interventions and outcomes. We introduce, discuss the history of adoption and use, and identify advantages and limitations of concepts and tools from the SES perspective together with current practices in applied conservation MEL. As an example, we compare a traditional conservation planning and monitoring tool, linear conceptual models called 'results chains,' to a SES mapping tool, referred to as causal loop diagrams (CLDs). Using this comparison, we explore different ways of visualizing and understanding theories of change for community-based conservation interventions. SES research tools such as CLDs hold great potential for conservation MEL. We argue CLDs can be useful for highlighting nuanced feedbacks and dynamics between social and ecological components of a system, and for bringing a social-ecological resilience lens to conservation. We acknowledge there is no 'one size fits all' tool, rather different tools will be suitable for different MEL users and audiences, and for different contexts and types of interventions. Given this, we outline opportunities for SES thinking to infuse conservation MEL, and call both the conservation and SES research communities to bridge the divide between theory and practice, and co-develop tools and methods appropriate for adaptive management grounded in evidence.

EX-SITU CONSERVATION OF SUCCULENT PLANTS: EXAMINING TENSIONS IN HORTICULTURE

Lucas Majure, Desert Botanic Garden; Olwen Grace, Royal Botanic Gardens, Kew

Succulent plants comprise one of the most striking categories of land plants. The presence of water-storing tissues within the plant body is the defining characteristic of the succulent syndrome, and allows plants to withstand regular and prolonged periods of drought. Examples include the cacti (Cactaceae; 139 genera/ 1,860 species), ice plants (Aizoaceae; 125 genera/ 2,000 species) and

euphorbs (Euphorbioideae; 39 genera/ 2,800 species). Typically, succulent taxa are narrowly distributed with high rates of endemism and specialised habitat requirements. Conservation assessments (e.g., IUCN) indicate grave threats to much of the global succulent plant diversity, while trade regulation such as CITES highlight the taxonomic complexities of species-level identification in many succulent groups. Curated living collections are vital for the ex situ conservation of succulent plants; the conservation value of such collections depends upon horticultural excellence. Paradoxically, the demand for wild-collected plants for other horticultural purposes, notably private collections and the ornamental trade, are among the most problematic threats to succulent plants in situ. Sculptural form and species-rank diversity make succulent plants appealing collectibles, whilst they are increasingly favoured for water-wise gardening and landscaping in arid environments. Here, we illustrate the importance of horticulture as a conservation tool, and its driving of an unsustainable demand for succulent plants. We examine this tension, and the complex underlying causes, in exemplar succulent plant groups and propose mitigating steps for the conservation and sustainable use of succulent plants in future.

EXTREME CONSERVATION CONFRONTING SPECIES LOSSES AT THE EDGES OF THE WORLD

Joel Berger, Colorado State University; Cynthia Hartway, Wildlife Conservation Society;

Declining glacial and sea ice is often accompanied by altitudinal and northward expansion of animals. Rapid changes in cold, snow, and drought regimes create uncertainty about the persistence of cold-adapted species. Here we examine how alteration of abiotic factors affects the biology of two extreme but unrelated species at the distal edges of their ranges – wild yaks and muskoxen, each averse to deep snow. Based on empirical field data gathered by non-invasive photogrammetry spanning eight years at three sites in the Russian and Alaskan Arctic, we assessed how drought and repeated minor rain-on-snow events (ROS) affect skeletal growth in juvenile muskoxen (N=781). An increase in ROS events during gestation retarded maturation for up to three years. Our unanticipated finding of a growth handicap in body size reveals one mechanism by which changing climes affect this Arctic-adapted species. Further, we asked how the sexes of wild yaks above 5000 m on the Tibetan Plateau respond to changes in peri-glacial environments, and used data from three winter expeditions spanning a decade. Females on average were 5 kms closer to glaciers, and their densities twenty times greater at tiny snow patches than males in mid-winter. Knowing why these differences occurred would not have been possible without fieldwork which revealed females lactated despite ambient temperatures to negative 30oC; hence, increasingly patchy snow– not ice – substituted as sources for water to support milk production. Findings from our respective projects underscore the importance of combining field data with modeling and remote sensing to to understand mechanisms that may dictate alterations of species biology as landscapes change. Yet, despite the growing reality of climate burden, if we do not react to the immediacy of human impacts and their associated conflicts with wildlife, we will fail to conserve iconic species that define the northern remote and extreme elevations.

FILLING THE SCIENCE-TO-POLICY GAPS: BOUNDARY PRACTITIONERS IN MARINE CONSERVATION

Kathryn Matthews, Oceana; Angela Bednarek, Pew Charitable Trusts; Charlotte Hudson, Lenfest Ocean Program

Conservation has an unsung, but growing, group of heroes. They are not, first and foremost, our field's researchers, managers, and decision makers. Instead, they occupy the spaces between these and other groups, acting as connective tissue linking our communities' needs, best available science, and policymaking processes. These boundary practitioners' professional backgrounds and home organizations vary widely, including lawyers in government, scientists in academia, advocates at non-profits, and program officers at foundations. However, because they are found in a variety of positions, do not (yet) have a professional society or other formal forum, and they are neither the knowledge generators nor target users, recognizing their contributions at a strategic level and identifying when or how to engage them is difficult. But as a group, these science-policy intermediaries have now begun to articulate their own best practices, necessary skill sets, and successful case studies. This talk will explore examples of how the conservation community can better employ these people and practices to ensure more effective engagement when addressing today's complex environmental challenges. In an increasingly "noisy" and politicized policy world with limited financial and human resources, boundary practitioners can help us craft better research questions and plans, execute otherwise unwieldy collaborative projects, and amplify messages and outcomes with our target audiences. The science of conservation has been an early adopter of stakeholder engagement and interdisciplinarity – here is another opportunity to continue that trend.

FISHERS' ECOLOGICAL KNOWLEDGE FOR ENDANGERED SEA TURTLE CONSERVATION IN CENTRAL AMERICA

Kathryn Wedemeyer-Strombel, University of Texas at El Paso, Eastern Pacific Hawksbill Initiative; Michael Liles, University of Texas at El Paso; Markus Peterson, Tamu; Tarla Peterson, University of Texas El Paso

The importance of Fishers' Ecological Knowledge (FEK; a combination of traditional and local ecological knowledge) is acknowledged in fisheries conflict literature, but is often ignored by biologists as anecdotal. Ignoring local knowledge of eastern Pacific (EP) hawksbill sea turtles (*Eretmochelys imbricata*), led biologists to incorrectly assume hawksbills were locally extinct until 2007, when biologists finally heeded the advice of local fishers and re-discovered this population. The pivotal finding stemming from FEK of the species was that adult EP hawksbills are nesting and foraging in an unexpected habitat: mangrove estuaries. However, professional scientists remain unsure how EP hawksbills utilize mangrove habitat during other life history stages, especially during the early developmental years. Local fishermen can provide robust qualitative data, via FEK, on the developmental grounds of EP hawksbills, including: abundance, demography, and seasonality, among other factors. These data can provide critical baseline information for understudied populations, and can inform future conservation initiatives. In the present case study, I hypothesize that at least some EP hawksbills develop within, and remain throughout their lives, as residents of the mangrove estuaries that serve as their primary rookeries: Bahía de Jiquilisco, El Salvador and Estero Padre Ramos, Nicaragua. To test my hypothesis, I conduced participatory action research and employed FEK to create the first-ever detailed habitat-use map of EP hawksbills. FEK gleaned from 38 informant directed semi-structured interviews generated over 275 data points, detailing size and abundance of EP hawksbills throughout their primary estuaries. FEK and preliminary in-water capture data support my hypothesis. This study highlights the importance of interdisciplinary research and the utility of harmonizing the social and natural sciences for conservation, especially for data deficient endangered species.

FOLLOW THE MONEY: ANALYZING FUNDING VIEWS OF CONSERVATION "SUCCESS" THROUGH COUNTRY-SCALE MAPPING

Katia Nakamura, University of Illinois, Urbana-Champaign; Daniel Miller, University of Illinois, Urbana-Champaign

Funding for conservation is crucial to meeting biodiversity objectives, but decision-making processes underpinning the allocation of funding often remain opaque. Knowledge of conservation funding flows and processes is especially sparse in biodiversity-rich developing countries. In addition to biodiversity importance and need a variety of other factors may shape resource allocation decisions, including donor type, economic development priorities, governance, previous funding experience, distance from metropolitan areas, and others. To shed light on funder preferences and on-the-ground funding flows, we collected data on financing for protected areas from domestic and international funding sources for Peru from 2009 to 2015. We then developed and tested a funding allocation model based on extant cross-country analyses to identify key determinants and priorities for funding in Peru. Preliminary findings suggest that the Peruvian government allocates its funding towards strict conservation projects whereas international donors and conservation NGOs exhibit preference for mixed funding. The presence of higher deforestation on buffer zones, a higher biodiversity need, and the number of tourists received seem to be the main drivers of investments on the national protected areas system. Further, areas with need for financial support are identified. Our findings provide evidence to practitioners, policy makers and scholars about funding allocation, showing existing preferences and gaps. This evidence can help improve accountability for financial flows and guide a more targeted planning towards defined priorities.

FOREST MONITORING IN COLOMBIA: TOP-DOWN AND BOTTOM-UP APPROACH

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The area of natural forest in Colombia with respect to the total area of the country has been declining gradually since 1990 with values corresponding to 56.4% in 1990, to 53% in 2010 and more recently and as mentioned to 51.6% in 2014. Many public, private, bilateral and multilateral initiatives have been implemented in the framework of mitigation and adaptation to climate change through low carbon development strategies, reducing deforestation and increasing resilience. Here

we present a collaborative research between multiple agencies and researchers articulated with the National Forest and Carbon Monitoring System (SMByC) to develop a platform, tools and advance on novel methods to detect and quantify deforestation in Colombia. Top down and bottom up approach integrates multiple actors (local peasants, local and national government agencies, SMByC, scientist, general public, donors, etc.) involved on the forest dynamics trough tools and information to provide a communication based on science that report forest tendencies at local scales. This approach integrates local data produced by communities as national or regional data provided by SMByC and projects to contribute to forest governance at local scale, project assessments about the effectiveness on avoided deforestation and report to national monitoring system

FROM ASSESSMENT TO CONSERVATION: USING THE IUCN RED LIST OF THREATENED SPECIES TO PROTECT AMPHIBIANS

Sally Wren, University of Otago, IUCN SSC Amphibian Specialist Group; Jennifer Luedtke, IUCN SSC Amphibian Specialist Group; Kelsey Neam, Global Wildlife Conservation, IUCN SSC Amphibian Specialist Group

Global amphibian decline and extinction have been well reported worldwide, but in spite of this amphibians are still often overlooked as the focus of conservation programmes in favour of larger charismatic megafauna. The IUCN Red List of Threatened Species assesses the global extinction risk of taxa; all amphibian species were assessed in 2004 and work is underway to re-assess all amphibian species worldwide. Currently 33% of Latin American amphibian species are assessed in a threatened category (Critically Endangered, Endangered or Vulnerable) compared with just 18% of mammals and 14% of birds. We present the latest amphibian data from The IUCN Red List of Threatened Species, including the current status of amphibians in Latin America, and link this to global data. Further, we argue that amphibians are deserving of conservation attention, and in fact focusing on amphibians can provide information about key threats in this region. A Red List assessment is the first step in effective species conservation planning, providing baseline information on the status of a species and its threats, as well as an evaluation of global extinction risk. Since many threatened amphibians have restricted ranges, conservation progress can be made by working with local partners on relatively localised and focused activities. Specific examples will be provided from Latin American countries, where conservation actions have been tailored to the local challenges and opportunities, and positive outcomes for threatened amphibians have been achieved by working with local partners. Regular re-assessment of species can help to monitor the effectiveness of conservation efforts and progress towards meeting targets, to identify sites for conservation action, and provides up to date information on specific threats.

FROM DUNG TO DEMOGRAPHY: USING NONINVASIVE METHODS IN THE CONSERVATION OF ELEPHANT POPULATIONS

Lori Eggert, University of Missouri; Marissa Ahlering, The Nature Conservancy; Kiristin Budd, University of Missouri

Elephant populations once ranged across much of Africa and Asia, but increases in human populations have resulted in the isolation of populations in fragmented habitat. Although recent genetic studies have provided information about the social structure and evolutionary history of the extant species, far too little is known about the effects of habitat fragmentation on populations inside and outside of protected areas. Using DNA extracted from elephant dung, we investigated patterns of connectivity among protected areas in southern Kenya and northern Tanzania and inferred the source of immigrants onto newly available, semi-protected community land. Our results highlight the importance of semi-protected and unprotected habitat for maintaining the connectivity of populations of elephants, given that few protected areas are large enough to sustain viable populations. In this region, elephants live in close proximity to humans, livestock and agriculture. We investigated the ecological and evolutionary dynamics of human-elephant conflict in one of its most common forms, crop-raiding. In contrast with previous studies and theoretical predictions, we found evidence of crop-raiding by female elephants. To investigate the potential role of physiological stress in crop-raiding, we compared levels of glucocorticoid metabolites and parasite loads among crop-raiding and non-crop-raiding elephants as well as among individuals from different habitat types. We compared microbiome profiles among species and habitat types as well as between crop-raiding and non-crop-raiding elephants. The results of our studies, based entirely on noninvasive sampling methods, allowed us to gain unparalleled insights into elephant ecology and to provide valuable information to aid in the conservation of declining populations.

FROM NATIONAL TO GLOBAL: BUILDING AN INTEROPERABLE NETWORK OF BIODIVERSITY OBSERVATION SYSTEMS

PJ Stephenson, IUCN SSC Species Monitoring Specialist Group

Many government agencies, non-governmental organizations, local communities and businesses cannot access or use the biodiversity data they need to make informed decisions for environmental management. This jeopardizes efforts to conserve biodiversity and leads to the overexploitation of natural resources. Here we compile evidence from three recent studies to: a) identify environmental decisions that require biodiversity information; b) map data gaps; c) explore blockages and potential solutions to data access and use. The broad suite of data gaps is explained, with taxonomic and geographic breakdowns. The key enabling environment for filling gaps and enhancing information flow includes data availability, quality and usability, willingness to collect and use data, and financial and technical capacity. We recommend that government departments across sectors work with academic bodies and NGOs to: i) enhance the allocation of resources for monitoring; ii) build capacity for data collection, focusing on filling identified gaps in national and global data sets; iii) improve national and international co-ordination and cross-sectoral collaboration for biodiversity data management; iv) produce and use more data-derived products, especially dashboards, to facilitate interpretation and analysis. While satellite-based remote sensing (especially if linked to Essential Biodiversity Variables) can meet many biodiversity data needs, we underline the importance of complementing ex situ data from space with in situ field observations and highlight relevant tools. We propose to build on existing models to test different science-policy interfaces in a handful of pilot countries. Ultimately, data for sustainable natural resource management will only become available if data providers and users can work together through such interfaces to break down barriers to data access and sharing and mainstream biodiversity information into decision-making.

FROM PIXELS TO DECISIONS: USING REMOTE SENSING DATA TO INFORM CHIMPANZEE CONSERVATION IN TANZANIA

Samuel Jantz, Department of Geographical Sciences, University of Maryland; Lilian Pintea, the Jane Goodall Institute-USA; Matthew Hansen, Department of Geographical Sciences, University of Maryland; Shadrack Kamenya, the Jane Goodall Institute-Tanzania; Emmanuel Mtiti, the Jane Goodall Institute-Tanzania; Janet Nackoney, Department of Geographical Sciences, University of Maryland; Alexander Piel, School of Natural Sciences and Psychology, Liverpool John Moores University; Nick Salafsky, Foundations of Success

The Jane Goodall Institute (JGI) and its partners are using remote sensing and cloud computing to build a practical, scalable and operational Decision Support System (DSS) to map, model and predict near-real time chimpanzee habitat health in Africa to inform conservation strategies from village to range-wide scales. This DSS integrates over 15 years of 30-meter resolution Landsat satellite imagery with species-specific habitat suitability and network connectivity models and a model forecasting future land use change, enhanced by crowd-sourced field data collected by local communities and rangers using mobile technologies. However, the ultimate success of our DSS will depend on understanding how conservation decisions are made and designing a DSS that works within that management framework. JGI uses the Open Standards for the Practice of Conservation (OS) to guide its institutional strategies and to work with partners and key stakeholders to develop shared conservation plans. In this presentation we discuss how our DSS has been used in combination with the OS process for systematic planning, implementing and monitoring chimpanzee conservation initiatives in Tanzania. This includes a review of Gombe-Mahale Ecosystem Conservation Action Plan and the development of a National Management Plan for Chimpanzees in Tanzania. In conjunction with the OS framework, the DSS was able to help decision makers helped estimate the viability of both forest and woodland chimpanzee habitats and to assess the effectiveness of conservation strategies from village forest reserves to National Parks and larger management units. For example, the DSS helped show that, overall, conservation strategies have been successful in managing chimpanzee habitats dominated by miombo woodlands, but failed to protect riverine evergreen forests. As a result, new strategies have been proposed to protect the riverine forests in the next iteration of the plan for the next 5 years.

FROM THE GROUND TO THE CLOUD: BIG DATA ANALYTICS FOR CONSERVATION

Tanya Birch, Google Earth Outreach

For many years, conservationists have relied on gathering biodiversity data from ground-based sensors including camera traps, acoustic devices, and citizen scientists. Researchers need infrastructure to host, store and manage that data, as well as tools to process and analyze the data. Gobs of such data can be quickly processed using computer vision and machine learning, making biodiversity information much for readily available for analysis. In this session, we'll explore some cutting-edge examples of machine learning and artificial intelligence put into practice for species detection and identification, and examine tools for managing, analyzing and visualizing biodiversity and conservation data. For example, Google Earth Engine presents petabyte-scale analytical capabilities for geospatial and remote sensing applications, and

Google Earth offers storytelling capabilities to engage a broader audience and share your scientific results with millions of users around the globe.

FROM YELLOWSTONE TO YUKON: CONNECTIVITY AND LARGE-LANDSCAPE CONSERVATION

Jodi Hilty, Yellowstone to Yukon Conservation Initiative; Aerin Jacob, Yellowstone to Yukon, Y2Y Conservation Initiative; Harvey Locke, Harvey Locke Consulting

Conceived nearly 25 years ago, the vision of connecting and protecting habitat from Yellowstone National Park to the Yukon Territory was one of the first very large, collaborative missions for landscape-scale conservation in the world. One of the conceptual challenges in large landscape conservation is that action often occurs locally but science and vision are often at larger scales. This begs the question as to whether having a much larger vision can impact and guide cumulative localized efforts in a meaningful way. Set in the global context of the draft IUCN connectivity conservation guidelines, this talk will cover the significant progress made on connecting and protecting wildlife and habitat across the Y2Y region. Successes include increasing the number and size of protected areas, designating management and improving conservation value on other lands, and implementing arguably the most progressive wildlife crossing structures in the world. Progress can be assessed from local to landscape scale. However, many conservation challenges remain and further applied work is needed, presenting opportunities for academics, civil society, and communities to engage in practical, effective conservation science and practice.

FUNCTIONAL DIVERSITY OF AN ANDEAN ALDER FOREST PLANTATION: IMPLICATIONS FOR BIRD CONSERVATION

Maria Ospina, Universidad de Caldas; Juan Betancurt, Universidad de Caldas; Gabriel Castaño, Universidad de Caldas; Angela Vargas, Universidad de Caldas

Protective forest plantations have been used worldwide as a strategy for restoration and bird conservation. The success of this strategy has been quantified mostly using species diversity. However, novel analytic approaches such as functional diversity allow to quantify the species response to the environment and its effects on the ecosystem functioning. Thus, functional diversity becomes a key input to quantify the species response for conservation strategies. In this study we compare the functional diversity among four Andean Alder (*Alnus acuminata*) plantation stands and four secondary forest patches. We used bird species abundance, traits (morphological and behavioral), and environmental matrices to compare functional diversity and redundancy between those forest types. We determined the bird functional traits of each habitat type that explain the functional diversity variance. Alder plantation and secondary forest did not differ in both functional diversity (Q) and redundancy. On the other hand, nesting in holes, foraging behavior (bark and flycatcher foraging birds) were the dominant traits at plantations; whereas diet (nectarivorous), flower visitors, and social behavior (monospecific bird group) dominated at secondary forest. Those results suggest that Andean Alder plantations can bring on the conservation of bird functional diversity in highly disturbed regions such as the Central Andes. Despite these plantations cannot be considered as a replacement of native forest, they add to bird conservation by providing complementary functional diversity to the avifauna assemblage.

GENERATING OCCUPANCY BASELINES FOR MONITORING THE IMPACT ON WILDLIFE OF DEVELOPMENT PROJECTS

Robert Wallace, Wildlife Conservation Society

In Colombia, the habitat alteration due to anthropogenic causes and climate change has led to secondary contact between species of Birds, such as Ramphocelus icteronotus, species that extended its distributional range (Chocó biogeographic) to the northeastern of the country, being found in sympatry with R. dimidiatus, resident species in this region. A possible consequence of this coexistence is the loss of genetic variability in the local species because hybridization could occur between both species. According to the above approach, the objective of this work was to evaluate the diversity and the degree of genetic structure, from the analysis of genotypes given by heterologous microsatellites markers and ND2 gene sequences, in sympatric populations of R. dimidiatus and R. icteronotus present in agroecosystems zones in Santander department. It was found that the genetic, haplotypic and nucleotide diversity in R. dimidiatus was higher (He=0,881±0,065, h=0,895±0,026 and ϖ=0,0048±0,003, respectively) than R. icteronotus (He=0,807±0,083, h=0,890±0,035 and ϖ=0,0026±0,002), species where 10 ND2 haplotypes were characterized in contrast to the 19 found in R. dimidiatus. The degree of genetic differentiation between the two species is high, corroborated by the RST=0,1969 and ΨST=0,9421 indices, as well as a Bayesian analysis under the mixing model, which showed two different genetic bases (K=2; ΨK=157.82). The neutrality indices D (Tajima) and Fs (Fu) reflect a recent population expansion of R. icteronotus.

Based on genetic diversity indices, it can be concluded that the genetic diversity of R. dimidiatus is high, suggesting that it doesn't require the assignment of conservation status despite the sympatry with R. icteronotus, however, actions aimed to preserve the agroecosystems integrity would be required, due to the haplotypic richness detected in both species.

GENETIC RESCUE: MANAGING EVOLUTIONARY PROCESSES WITH GENOMICS

Paul Sunnucks, Monash University; Katherine Harrisson, La Trobe University, DELWP; Alexandra Pavlova, Monash University

Wildlife populations worldwide are subject to human-induced genetic deterioration. Without intervention, many will become extinct, with evolutionary genetic issues - notably inbreeding depression and loss of adaptive potential - being major contributors. Genetic rescue – augmented gene flow in populations suffering genetic problems – is a promising management option. Genetic rescue can elevate the fitness of individuals and populations and increase evolutionary potential, enhancing prospects for population persistence. Although genetic rescue is powerful, it has been conducted fewer than two dozen times in the wild. In those cases, outcomes were overwhelmingly positive. Genetic rescue can be highly effective and inexpensive, and might often make the difference between persistence and extinction. Why then is it not routinely implemented? Reasons include concerns over outbreeding depression and genetic swamping. But these risks can be assessed, and it is common to ignore the greater risk of doing nothing. Thus genetic rescue is appropriately assessed in a risk-analysis framework. Starting with explicit conservation goals, management programs can then be designed to optimize gene flow between isolated populations. New genome-wide screening provides for comprehensive input into risk assessment processes regarding optimizing genetic diversity in species of conservation concern, for planning and implementation of management actions, and then adaptively monitoring the outcomes of actions. With good reason, there are increasingly urgent calls to genetically rescue populations of concern. Unless we do, we will manage small, isolated populations to extinction. We advocate learning-by-doing: conducting genetic rescue in on-ground conservation management settings, designed as experiments. We outline with examples from recent cases how genomic approaches can contribute to maximizing the benefit and minimizing the risk of managing evolutionary processes.

GEOJOURNALISM: ENHANCING CONSERVATION STORIES WITH DATA COLLECTION AND VISUALIZATION

Stefano Wrobleski, InfoAmazonia; Gustavo Faleiros, InfoAmazonia.org

Globalization has heightened the need for interdisciplinary conservation efforts. Scientists have become increasingly interested in the art of communication, and journalists have begun to collect and visually present their own spatial data to strengthen their narratives. The latter exemplifies a burgeoning field called geojournalism. Data collection is no longer exclusive to scientists: along with the citizen science movement encouraged by biologists, journalists have begun collecting their own data to expose environmental injustices and to encourage accountability. New digital media tools and sensing devices--from drones to gas-reading instruments--is revolutionizing our ability to gather, visualize and display critical environmental data on a global scale. It is also democratizing access to that information in many countries where such data has long been hidden or unobtainable. InfoAmazonia.org is an innovative platform that provides timely news and reports of the endangered Amazon region by telling stories with words, maps, and data. This data is made freely available for download and is renewed frequently by a network of organizations and journalists who deliver updates from the nine countries of the forest. This new way of leveraging stories and data aims to improve the public's awareness of issues in the Amazon region by reporting on local stories visually situated in a global context.

GLOBAL HOTSPOTS OF SPECIES THREATENED BY UNSUSTAINABLE HARVEST

Enrico Di Minin, University of Helsinki

Unsustainable harvest is threatening the persistence of thousands of species globally. Identifying global priority areas where to take urgent actions to stop unsustainable hunting and fishing is crucial. It is also important to identify which key biodiversity areas and protected areas are potentially most vulnerable. Here, we did so by using spatial conservation prioritization in combination with other spatial analyses to identify priority areas for the conservation of over 4,000 threatened and near-threatened species from comprehensively assessed species groups in the IUCN Red List, which are being over-exploited for trade, recreation or subsistence, both on land and sea. Our results show that large proportions of the top priority areas for the conservation of these species, including areas where some of the rarest species with the smallest ranges occur, are potentially under high threat. Neither conserving the species in areas where there is low

threat nor in countries where political, social and economic stability are higher would help achieve similar return on investment for the species as in highly threatened areas. Our results also highlight that a high proportion of all terrestrial and marine key biodiversity areas, which are the most important sites for global conservation, where these species occur are potentially threatened. Unless immediate actions are taken it is likely that many of these species will further decline both inside and outside of protected areas.

GLOBAL PATTERNS OF BIRD RICHNESS AND ABUNDANCE ALONG URBANIZATION GRADIENTS AND GREEN AREAS

Lucas Leveau, CONICET

Urbanization is expanding continuously over natural and seminatural areas, it is essential to analyze its impact on biodiversity. The density- diversity paradox hypothesis proposes that urbanization favors the presence of bird communities characterized by higher densities than non-urban areas and with the presence of fewer species. On the other hand, although green patch size is a primary factor in determining bird species richness in urban areas, the worldwide consistency in the species- urban green area relationship (SRAu) remains unexplored. The objectives of this study were: 1) to explore global patterns of bird richness and abundance along urbanization gradients; 2) to assess the best model explaining the SARu; and 3) to analyze the global heterogeneity of SARu parameters, such as the fit and slope of the power model. We performed meta-analysis to analyze global effects of urbanization on bird richness and abundance and the presence of significant heterogeneity in results. We found a significant positive relationship between urbanization and bird abundance, and a significant negative relationship between urbanization and bird richness, supporting the density-diversity paradox hypothesis. Study grain, latitude and the number of exotic species in each study affected significantly the relationship between bird richness and urbanization. Continent affected the relationship between bird abundance and urbanization. Regarding the SARu, the linear model was found to be the best model for explaining the SARu; however, this model was affected by the number of patches in each study. The power function showed a consistent positive effect of area size on bird richness (slope = 0.20). Overall, our results showed that the impact of urbanization on bird richness and abundance is dependent on biological, methodological and socioeconomic factors. Furthermore, management actions that promote large green urban environments will have positive effects on bird richness worldwide.

GLOBAL RESTORATION PRIORITIES FOR ACHIEVING PROTECTED AREA TARGETS

Bonnie Mappin, University of Queensland

Critical in averting a biodiversity crisis and achieving the Convention on Biological Diversity (CBD) overall mission is the role of Protected Areas (PAs). Under CBD's Aichi Target 11, signatory nations ambitiously agreed that 17% of terrestrial environments especially areas of particular importance for biodiversity and ecosystem services be conserved in effectively and equitably managed, ecologically representative PAs by 2020. The representative clause of Target 11 has been widely accepted to be 17% of each of the 827 terrestrial ecoregions to be PAs by 2020. However, only 43% of ecoregions have reached the 17% area target. It has not been identified if it is possible to achieve 17% coverage of each ecoregion from suitable relatively intact land. If shortfalls occur, then habitat restoration will be necessary to meet Aichi Target 11. Here, we present the initial findings of the first global assessment determining which terrestrial ecoregions fail to have enough intact unprotected land remaining to reach 17% protected area coverage. Within these identified ecoregions, we pinpoint the priority locations for restoration to minimise cost and the relative effort of restoration. Our results demonstrate the need for future targets to include restrictions on the expansion of degradation of habitat. As human populations continue to grow and the exploitation of natural resources escalates, constraints of the amount of area that can be cultivated, urbanised or modified is imperative.

GOVERNANCE AND POLITICS OF REDUCING THE THREATS OF DEFORESTATION AND FOREST DEGRADATION THROUGH PROTECTED AREAS IN THE PERUVIAN AMAZON

Judith Schleicher, University of Cambridge

In light of the persisting conservation pressures despite considerable conservation efforts, there have been increasing calls for interdisciplinary approaches to rigorously evaluate conservation impacts to ensure that conservation efforts have their intended impacts. While protected areas (PAs) have been the main conservation strategy globally, relatively little is still known about the performance of PAs under different governance regimes and the factors influencing their success. To contribute towards addressing these gaps we evaluated (1) the performance of PAs under different governance regimes in reducing the pressure of deforestation and forest degradation in the Peruvian Amazon, and (2) the opportunities and challenges of implementing PAs. We therefore integrated quantitative and qualitative data

derived from remote sensing, GIS datasets, and semi-structured interviews to better understand: (1) whether state-controlled PAs, Indigenous Territories and private Conservation Concessions (CCs) helped to reduce deforestation and forest degradation between 2006-2011 in the Peruvian Amazon, using a counterfactual approach; and (2) the opportunities and challenges perceived by different stakeholders of implementing PAs, focusing on CCs. CCs are a novel conservation tool promoted in various countries, including Peru. They comprise public land given to non-state actors for conservation purposes. The study highlights that compared to matched unprotected land, PAs under different governance regimes reduced the likelihood of deforestation and forest degradation between 2006 and 2011. While CCs were more effective in this respect than state-controlled PAs, several institutional, social and political challenges have constrained their conservation impacts. The research further provides useful lessons learned with regards to overcoming some of these challenges, with important implications for feeding conservation science into conservation policy and practice on the ground.

GREEN CITIES: ANTHROPOGENIC BIODIVERSITY HOTSPOTS

Brigitte Baptiste, Instituto de Investigación de recursos Biológicos Alexander von Humboldt

Latino america's shift towards urbanization has brought deep changes in natural ecosystems and ecosystem services characterizing this region. A phenomenon that has generated from loss and transformation of multiple natural land covers, reduction in populations of several wildlife species, to negative impacts on people well-being living in most cities of this world region. A fact evident trough social and environmental conflicts and poverty growing in several Latin American cities, that has in the biodiversity loss one of their main drivers. Although innovations are emerging, the willingness to better relate to nature in these cities of is a promising beginning. Should developing countries such as Latin Americans, consider efforts to conserve biodiversity in cities as a priority factor to human development? What role should play different stake-holders in the understanding and management of this urban biodiversity? How should be the approach to face the challenge of reducing the gap between scientific knowledge, management and urban planning and decision-making in cities? Conceptual and practical approaches developed by the Alexander von Humboldt Institute in Colombia to address these questions are presented. First in relation to a process of support to national, regional and local authorities in the incorporation of biodiversity and ecosystem services on tools and strategies for urban planning. Second, associated to the results of a book published in 2015 called "Naturaleza Urbana: Plataforma de Experiencias". An action-oriented research that seeks meeting multiple local experiences in urban biodiversity conservation and provide a toolbox that serve to manage nature and ecosystem services in cities of Colombia. Some of the insights and conclusions of Naturaleza Urbana is presented, expecting contributions, proposals and questions to help us rethink the role of nature in this new urban age in the Latin American context.

HARNESSING THE MOBILE REVOLUTION TO IMPROVE SMALL-SCALE FISHERIES MANAGEMENT

Jennifer Chapman, Blue Ventures

Fisheries and aquaculture support the livelihoods of at least 10 percent of the world's population, yet 75 percent of fish stocks are either fully or overexploited, with severe declines reported for many elasmobranch species. Reversing this trend requires improved management, which depends on accurate stock status data. Yet the majority of fisheries, in particular small-scale fisheries in the developing world, are unmonitored. Recent advances in technology and the rapid extension of mobile networks in places previously unconnected have seen new data collection systems being utilised. This study reports lessons learned from the first trial (2013-2015) where community members used smartphones as data collection tools, in the data deficient, artisanal elasmobranch fishery of SW Madagascar. The pilot demonstrated that mobile technology can empower fishers and other stakeholders to collect important data to support adaptive fisheries management, whilst reducing time for data collection and entry. Key challenges encountered were the lack of infrastructure, low levels of education and limited prior knowledge of technology within the community. The project worked closely with community members to develop suitable mobile data collection and training tools to which were tailored for the local socio-economic and geographical context. With global access to 4G networks growing, the role of mobile-based citizen-science apps has enormous potential for improving the speed of data collection, entry and dissemination for research, conservation and natural resource management programmes. Based on the lessons learnt in the pilot, this is now being adapted to new geographies and contexts by Blue Ventures, including community led multi-species fisheries catch monitoring in Mozambique, Timor-Leste and Comoros.

HIGH COMPLEMENTARITY IN BIODIVERSITY, RIPARIAN AND CARBON VALUES: TAX-SHIFTING PAYS IN THREE WAYS

Peter Arcese, University of British Columbia; Elizabeth Law, University of Queensland; Tara Martin, Dept of Forest Sciences; Amanda Rodewald, Cornell Lab of Ornithology; Richard Schuster, University of British Columbia; Kerrie Wilson, University of Queensland

Conservation in human-dominated landscapes is challenging partly due to the high costs of land acquisition. We explored property-tax programs as an alternative to acquisition in an effort to meet Convention on Biological Diversity (CBD) treaty targets to conserve critically imperiled Coastal Douglas fir ecosystems of the Pacific Northwest of North America. Specifically, we used systematic planning tools and empirical distribution maps of focal bird, plant, fish and reptile communities to prioritize 198,058 parcels for biodiversity values. We next estimated the cost of eliminating property tax on high priority parcels to engage land owners in conservation, and calculated the tax increase on non-priority parcels necessary to maintain tax revenue to government. Marginal tax rate increases of 0.13% on non-priority parcels were sufficient to offset the elimination of tax revenue on ~21,000 ha of high priority parcels, thereby increasing area protection from 9% to 17% and meeting CBD targets. We further show that high complimentary in the spatial distribution of focal species communities, riparian values, and standing carbon suggest outstanding opportunities to generate co-benefits to landowners, governments and others interested in enhancing carbon sequestration and storage, recovering anadramous fish stocks, and reducing extinction rates in the planning region. Our results offer a robust model for conservation planning in human-dominated landscapes that could also be used to identify opportunities to facilitate public-private partnerships in conservation finance.

HIGHLIGHTING EMERGING ISSUES OF A POST-CONFLICT SCENARIO IN COLOMBIA

Jose Ochoa-Quintero, Instuto Alexander von Humboldt

Colombia is attracting international attention as its government recently signed a peace deal with the major guerrilla group in the country: Fuerzas Armadas Revoluconarias de Colombia (FARC). The current peace process has divided public opinion at all levels of Colombian society between supporters and detractors of the negotiations. In this talk I discuss emerging issues that may negatively affect Colombia's natural capital hindering sustainable development in a post-conflict scenario. Aspects such as land restitution may increase forest cover loss in abandoned areas, as there are approximately 5 million displaced people in Colombia, and only 20,000 have returned to their lands. The possibility of improving stability and bringing peace to some areas may encourage investors to expand or increase their land holdings – a trend already in evidence where proposed investment in roads is increasing the anticipated value of land. This process may increase the displacement of small farmers into new colonization spots where cheap land is still available. Governments and NGOs have implemented crop substitution programmes to help farmers move away from this production. However, to increase the chances of success production of substitute crops must be extended, and basic infrastructure improved to enable these crops to reach the market. This, may increase the demand of agricultural land in the coming years. This is an initial overview of current and expected drivers of change that are likely to shape a post-conflict future, as well as the actors that may have an influence in the change process. It is expected that this presentation provides a reference point for exploration of the key interactions among and drivers reducing the sustainability of Colombia in a post-conflict scenario.

HORTICULTURAL PROPAGATION VERSUS WILD COLLECTION FOR COMMERCIALLY VIABLE YIELDS

Susanne Masters, Leiden University

With profit as the driving focus of trade in plants the cost of cultivation in comparison to the cost of wild collection is an important consideration when evaluating existing supplies or projecting future supplies of botanical ingredients and products. Not all plants are easy to cultivate, and obstacles to cultivation can be presented at the initial stage of propagation. Agriculture is dominated by domesticated plants that have become differentiated from their wild ancestors via trait selection by people cultivating them. Ease of propagation is an important component of cultivation. However, many wild-collected plants in trade are not replaceable by domesticated cultivars that are easy to propagate. Modern technology and advances in scientific knowledge on propagation are increasing the repertoire of plants that can be cultivated. However, factoring in the costs of propagation can make cultivation an unviable supply route from a commercial perspective. The case for evaluating commercial viability on a species by species basis is illustrated by contrasting examples of undomesticated vascular and non-vascular plants, propagated by different means, which are traded worldwide from both cultivated and wild collected sources.

HORTICULTURE AS STRATEGY FOR IN SITU AND EX SITU ORCHID DIVERSITY CONSERVATION IN THE ANDES

Tatiana Arias, The Corporation for Biological Research

Colombia has the highest number of endemic orchids in the world and some still remain unknown to science. Many species are endemic to small regions, and as result are threatened due to rapid habitat loss and low tolerance to climatic changes. Orchids are flagship and charismatic species that can help to promote the conservation of whole Andean forests and with them ecosystem services. The lack of basic knowledge and the conservation status in-situ of many species is truly worrisome. Private collectors have impressive ex-situ living collections and abundant natural history data, but this information is not currently organized or accessible. Although all orchids are currently included in Appendices I and II of CITES commercial collection and illegal trade aggravates existing population declines. Orchid cultivation secures species from being lost, allows us to study the species and understand their needs better, and provides a focus for ecotourism and a source of legally produced plants for trade. This talk aims to communicate a recent initiative taking place among three Colombian institutions: The Medellin Botanical Garden, The Corporation for Biological Research and the Colombian Orchid Society. We are implementing a proposal to preserve orchids of the Colombian Andes and their ecosystems by involving local communities in creating in-situ and ex-situ conservation strategies and by offering them an alternative mode of subsistence through eco-tourism, and legal orchid cultivation and commerce. This initiative will promote outreach and will allow to collect, cure, and analyze information for many orchid species in order to promote conservation and sustainable use as established in the Colombia orchid conservation strategy.

HOW DO WE PLAN FOR AND IMPLEMENT INCLUSIVE URBAN CONSERVATION?

Marit Wilkerson, USAID

Urban conservation holds the promise of inclusivity. While there is much to be gained in protecting biodiversity through a focus on urban systems, there is as much or more to be gained in terms of connecting people with nature. Across the globe, primary and secondary cities are becoming more diverse along all sorts of axes and ever more concentrated. One of the major downsides of increased urbanization is that nature deficit disorder often rises in parallel. On the upside, such centers of human diversity represent opportunities for increased diversity in the meaning and role of 'nature.' As such, urban conservation represents a significant and exciting challenge to scientists, planners, and managers to engage in truly inclusive conservation. I will detail case studies and empirical research that highlights the need and reward for inclusivity as exemplified in urban conservation. Using those, I will delineate major lessons learned and approaches for designing and implementing inclusive urban conservation. Enabling conservation organizations, approaches, and projects to speak to all sorts of people, from the voiceless to the mainstream, is one of our best ways at ensuring a sustained, holistic conservation ethic in our cities. It is also is a moral imperative within the conservation community.

HOW HUMAN RESPONSES TO CLIMATE CHANGE IMPACT BIODIVERSITY

Nikhil Advani, World Wildlife Fund

To date, most research around climate change and biodiversity has focused on direct impacts (e.g. coral bleaching), largely neglecting how humans are coping and adapting to these changes, and how these human responses might impact biodiversity. In particular, rural communities in developing countries are already experiencing the most severe impacts of climate change, but are often left to their own devices to cope and adapt to these changes. We need a better understanding of how they are responding. Are their responses harming biodiversity? Are there novel adaptation strategies we can learn from? This talk will explore some of the tools we are using to explore this emerging topic, as well as solutions we can implement to help people and nature adapt to a changing climate. Learn more at https://www.wwfclimatecrowd.org/

HOW IDENTIFYING DEVIANCE FROM EXPECTATIONS CAN INFORM REEF CONSERVATION AND MANAGEMENT?

Fraser Januchowski-Hartley, UMR MARBEC, Institut de recherche pour le développement; Leïla Apithy, Institut Agronomique Néo-Calédonien; Séverine Bouard, Institut Agronomique Néo-Calédonien; Stéphane Guyard, École des Mines de Nantes; Michel Kulbicki, UMR ENTROPIE, IRD, Université de Perpignan; David Mouillot, UMR MARBEC, Universite de Montpellier; Laurent Vigliola, UMR ENTROPIE, Institut de Recherche pour le Développement; Laurent Wantiez, University of New Caledonia

Coral reef socio-ecological systems have a long history of interdependence that complicates efforts to sustain long-term human use and biodiversity. More than 75% of coral reefs are severely threatened by human exploitation and climate change, and are expected to be functionally collapsed by the end of the century, jeopardizing the

benefits to both humans and nature of their existence. As a result, identifying pathways that result in more sustainable use of coral reefs have the potential to positively influence the livelihoods of millions of people across the tropics. Bright spots analysis, which seeks positive deviance or anomalies within systems, has been used at a global scale on reef fish biomass to identify key socio-economic determinants of reef condition and factors that drive differences from the expected. However, the utility of a global scale study on country or regional scale management is questionable, particularly since national socio-economic development, as well as local human demographics and management are important contextual drivers. Here we present a framework to conduct 'bright-spots' analysis at the country scale, and use ecological (fish biomass and diversity), demographic, and socio-economic data from a variety of sources and institutions to apply the framework in New Caledonia. We discuss challenges regarding scales at which ecological and socio-economic data are collected, methods we used to overcome these hurdles, and where country-scale influences differ from those at a global scale. Finally, we systematically identify reefs that can be considered either 'bright' or 'dark' spots, and using local-scale data on consider the management lessons they provide for reef conservation in New Caledonia.

HOW LAND-USE AND CLIMATE DEFINE THE VALUE OF COMMERCIAL BUSHMEAT HARVESTS IN GHANA

James McNamara, The Breakthrough Institute

Using 27 years of market data collected in the Atwemonom bushmeat market in Kumasi, Ghana, we examine the spatio-temporal dynamics of the bushmeat trade in south-west Ghana. We explore how changing patterns of land-use, rainfall and hunting pressure determine the economic value and species composition of bushmeat harvests from different landscape configurations. These figures are compared with estimates of potential revenues from agricultural yields to understand the relative natural capital value of bushmeat hunting in human dominated production landscapes. The results show that the economic returns on hunting are greatest in semi-disturbed landscapes, highlighting the potential for co-production. Returns are also negatively correlated to rainfall, suggesting that more open moist deciduous woodlands are economically more productive than wet tropical forest. However, the results also suggest that hunting in these landscape is unlikely to be able to generate sufficient revenue to compete with agricultural alternatives, suggesting that while hunting may represent an important livelihood support mechanism in the short-term, longer-term, a move towards more intensively managed farmland is likely to be a more rational economic decision. Ensuring that this transition occurs in a fashion that supports and enhances conservation objectives should be a priority.

HOW MUCH PROTECTED AREA DOES TROPICAL NATURE NEED? A CASE STUDY FROM SINGAPORE

Ryan Chisholm, National University of Singapore

How many species can persist in just a fraction of an originally forested landscape? Despite volumes of research on this topic, two key uncertainties remain: (i) As habitat is destroyed, how many undetected extinctions occur, i.e., how many species go extinct before they are even known to science? (ii) How does the spatial configuration of remaining habitat affect the number of species retained? I will present new research exploring these questions with a focus on the tropical city state of Singapore. Singapore is an important case study for tropical conservation because it has gone from nearly 100% forest to only 3% forest in 200 yr, and only a tiny fraction of the remaining forest is primary. Naïve species–area estimates predict a corresponding 35–50% species loss in Singapore. Previous authors attempting to account for undetected extinctions estimated that true extinctions were 28–73%. We estimate, by applying theoretical and statistical models to comprehensive historical data, that true extinctions are closer to the lower bounds of these estimates. Among Singapore birds, for example, we estimate that about 33% of species have gone extinct. The reason our estimates are towards the lower bounds of previous estimates is that (i) the problem of undetected extinctions is apparently less severe than previously thought and (ii) fragmented habitat loss allows more species to persist than does contiguous habitat loss, at least under certain conditions. If a highly developed city state such as Singapore can destroy over 99% of its primary forest yet retain about two thirds of its biodiversity, should we be more sanguine about tropical forest conservation globally? Does "nature need less than half"? I will conclude by discussing these broader implications of our research.

HYDROPOWER DEVELOPMENT AND FISH CONSERVATION IN COLOMBIA

Juliana Delgado, The Nature Conservancy; Hector Angarita, The Nature Conservancy; Luz Fernanda Jiménez-Segura, Universidad de Antioquia; Silvia López-Casas, The Nature Conservancy; Javier Maldonado, Pontificia Universidad Javeriana; Carlos Rogéliz, The Nature Conservancy

The Magdalena river basin is inhabited by 213 species of fish, half of them endemic and mostly distributed proportionally with elevation, while 16 migratory fish species sustains the major part of natural artisanal fisheries. Presence of the Andes generates altitudinal gradients in the freshwater systems as well as in associated biota. This Basin also concentrates the major part of Colombian social and economic activities. A growing economy and an expected increase of 45% in energy demand couple with Colombia commitment to reduce 20% of GEI emissions by 2030, would likely increase hydropower development. Consequently, increasing threats on Andean rivers and fish conservation are expected, as dam construction below 700 masl creates new gradients of species richness and alters rivers used by migratory species as spawning grounds. TNC is promoting an early planning process engaging key stakeholders through a collective action, in which Ministry of Environment as technical secretariat of the Basin´s Environmental Council has a fundamental role. The purpose of this stakeholders' process is to address cumulative effects from hydropower expansion, to avoid and minimize impacts on environment and social values. Relevant Basin areas for water regulation, prioritized habitats for fish biodiversity (with emphasis in migratory and endemic species), processes (such as fish reproduction and migration), sediment dynamics and river network connectivity, are some of the environmental criteria used. National Licensing Authority is already informing and complementing their single projects evaluation with these criteria. An early planning process will consider management options and total impact of alternative sets of projects in the whole system (the Basin), in comparison to a business as usual approach of project-by-project evaluation, indispensable in order to preserve fish biodiversity and fisheries in this socio-economic important Basin.

IDENTIFICATION OF EXTINCTION AND COLONIZATION DEBTS IN TREE SPECIES OF SOUTHERN SOUTH AMERICA

Patricio Pliscoff, Universidad Católica de Chile; David Uribe-Rivera, University of Melbourne

Climate is changing faster than species capacity of geographic redistribution, threatening the persistence of their populations. The identification of sites in which the climate will be no longer suitable for species persistence (i.e. extinction debts) and sites in which climate is turning appropriate beyond the colonization capacity of species (i.e. colonization debts) is a crucial issue to anticipate climate change impacts on biota. It can help in the definition of conservation priorities at the species level, allowing more effective approaches in conservation planning. Identifying extinction and colonization debts could be more relevant in endemism-rich areas where current anthropogenic impacts are urging more effective conservation efforts under high fragmented and perturbed areas. The Mediterranean and temperate forests of southern South America harbor more than one hundred of native and most of them endemic tree species within a large latitudinal and altitudinal gradient. Continuous and high fragmented forest zones persist under not only high human pressure conditions but also under bold climatic change in the last few decades, defining an interesting area to identify current extinction and colonization debts. We defined extinction and colonization debts in a spatially explicit way for fifty species using a dynamic and semi-mechanistic approach that enables the implementation of species-specific dispersal constraints into projections of Species Distribution Models (SDM) under contemporary climatic change. For the characterization of the recent historical and current climates, we developed novel high-resolution climatic surfaces, and used them to predict recent species range shifts. The results allow the identification of high priority's zones for the establishment of new protected areas and also a first step for a in the field research program for the assessment of the tree species responses at the population level to ongoing and future climate change.

IDENTIFYING SOCIO-ECONOMIC DRIVERS OF LAND ACQUISITIONS OVER A CENTURY IN CALIFORNIA

Maria Santos, Utrecht University

The extent of a conservation network is, in part, a result of the process through which conservation policies are implemented and result in designation or acquisition of land for conservation. Governance structure and socio-economic drivers may affect or slow down conservation implementation processes. The resulting conservation network may or may not be the best possible outcome, especially when conservation land acquisition competes with economic activities and population expansion. Here I analyze the historical process of conservation land acquisition in California between 1910 and 2010 to assess whether governance structure, socio-economics or both explain the variation in open space acquisition across time and jurisdiction. The most important factor to conservation acquisition is prior conservation action, this is likely because decisions on land acquisition for conservation are dependent on prior representation. I also found that more levels of governance result in more land acquired for conservation, likely because Federal, State, and County agencies may access different pools

of funding. Finally, there was a very tenue relationship between acquisition of land and socio-economics. During the last century, only population density was positively related to acquisition rate, and per capita income was negatively related to conservation acquisition since 1970s. This suggests that despite growing numbers of population leading to more conservation action, the more the income the least investment in conservation has occurred. These results can be also a result of increasing real-estate values of land, and opportunity-based acquisition strategies. Future conservation in urbanizing geographies may have decreasing available land for conservation at increasing land prices, and our results suggest a lock-in strategy based on prior conservation action.

IF YOU BUILD IT WILL THEY COME? MAMMAL DIVERSITY AND METACOMMUNITY DYNAMICS IN URBAN GREEN SPACES

Travis Gallo, Urban Wildlife Institute, Lincoln Park Zoo; Mason Fidino, Urban Wildlife Institute; Elizabeth Lehrer, Lincoln Park Zoo; Seth Magle, Lincoln Park Zoo

As urban growth expands and natural environments fragment, it is essential to understand the ecological roles fulfilled by urban green spaces. To quantify this, we studied the metacommunity dynamics of medium- and large-sized mammals in city parks, cemeteries, golf courses, and natural areas throughout Chicago, IL, USA. We found similar Ψdiversity (with the exception of city parks), but remarkably dissimilar communities in different urban green spaces. Further, the type of urban green space greatly influenced species colonization and persistence rates. For example, coyotes (*Canis latrans*) had the highest but white-tailed deer (*Odocoileus virginianus*) had the lowest probability of persistence in golf courses compared to all other types of green space. Additionally, most species had an equally difficult time colonizing city parks even when potential sites were seemingly available. Our results indicate that urban green spaces contribute different, but collectively important, habitats for maintaining and conserving biodiversity in cities.

INDICATORS OF COLLAPSE FOR ECOSYSTEM RISK ASSESSMENTS

Jessica Rowland, Deakin University; Lucie Bland, The University of Melbourne; Matthew Linn, Deakin University; Emily Nicholson, Deakin University

The rate and extent of environmental transformation and biodiversity loss has led to increasing global interest in assessing risk to ecosystems. Ecosystem risk assessment protocols, such as the IUCN Red List of Ecosystems (RLE), provide a consistent, transparent and robust approach to ecosystem risk assessment that is applicable across terrestrial, marine and freshwater realms. Extensive research has documented functional and distributional change leading to ecosystem collapse using a range of measures or indicators. Here we ask two questions: i) which indicators are most commonly used to quantify ecosystem collapse, and how they are selected and used; and ii) how appropriate are these indicators for assessing risks to ecosystems, and thus how can these studies inform robust and repeatable risk assessment? We conducted a systematic quantitative review on how indicators have been selected and used in studies of collapse across three ecosystem types (temperate forests, marine pelagic ecosystems, and estuaries). We evaluated the studies to determine: i) are conceptual models of the ecosystem presented; ii) are explicit selection protocols outlined to justify the indicators used; iii) what types of indicators are commonly used to assess collapse; iv) what time frame has change been assessed across; v) what methods are typically used for assessing change across multiple indicators; and vi) how has uncertainty been considered in the study. We found that the approach to quantifying ecosystem collapse differed considerably among ecosystem types, including the types of indicators commonly used, as well as whether a conceptual model or an indicator selection process were presented. These differences in the approach to selecting and using indicators of collapse have large implications not only for consistency across ecosystem types, but for making transparent assessments of ecosystems where ecological change is evaluated in a robust and meaningful way.

INDIGENOUS AND COMMUNAL STRATEGIES TO CONSERVE BIODIVERSITY IN THE AMAZON BASIN

Zulema Lehm, Wildlife Conservation Society; Robert Wallace, Wildlife Conservation Society

The use of GIS shows that some rural communities and Indigenous Peoples left a rather different footprint on Amazonian landscapes than other land owners. Thus, traditional natural resource access and use play an important role for landscape conservation as collective access and a diverse use system reduces impacts on the environment. This diversity in natural resource use must also be understood as an expression of culture. Historically these traditional systems were impacted by the expansion of "civilization", and extractive activities, infrastructure, cattle ranching and agriculture are now the most important economic activities in the Amazon Basin. Struggling with these threats, 30 years ago riverine communities in Perú and Indigenous Peoples in Bolivia and Ecuador started to implement new strategies to conserve

their territories and lands. These strategies were based on claims for the legal recognition of their rights over land and territory, whilst simultaneously beginning control over land incursions and illegal natural resource extraction, and developing self-imposed regulations over their own natural resource use. Appropriate zoning maps and Life Plans were designed and implemented with associated monitoring systems. These efforts resulted in significant "social capital", through strengthening horizontal and vertical "social bonding ties", and reinforcing ethnic and cultural identities. However, these actions were not enough and to ensure effective conservation of community land and indigenous territories, other relationships were needed: a kind of "social bridging ties" between the state and the communities or indigenous organizations. While "social bonding ties" helped in communal land and indigenous territory conservation, "social bridging ties" were crucial landscape scales conservation.

INDIGENOUS LANDSCAPE PUTUMAYO-AMAZONAS: MOSAIC OF RIGHTS FOR SUSTAINABLE AND RESPONSIBLE GOVERNANCE

Ana Rosa Sáenz, Instituto del Bien Común

The Great Putumayo Amazonas Indigenous Landscape is located in the northeastern Peru border with Colombia, between the Amazonas, Putumayo and Napo rivers with 3 788,658.90 ha of extension. The landscape has a total of 22,627 inhabitants, who mainly belong to the Bora, Huitoto, Ocaina, Yagua and Kichwa indigenous peoples, who play a major role in the conservation of forests and fisheries. This is identified as an area of high biological and cultural diversity, and therefore political instruments of the Peruvian government (national and regional) prioritize its conservation. Scientific studies emphasize the existence of a large expanse of virgin forest and an exceptional diversity of fish and wildlife, including the high value of carbon reservoirs. The Landscape is an array of categories of usage rights, consisting of 60 titled indigenous communities (620,988.73 ha) and 3 established protected areas and 2 under proposal (3 167,670.17 ha). A melting pot of ancestral and scientific knowledge make possible a sustainable and responsible governance of the forest and its ecosystem services, the following are important conditions for this achievement: Land-use Planning, the institutionalism of local agreements for the use and care of natural resources, communal surveillance supported by the State, respect for the organization and culture of the people, the economic undertakings linked to the market, the co-management of the ANPs. These processes have required the creation of capabilities in indigenous organizations and government entities such as: delegation of power and responsibility between the different government levels and civil society, trust in the public system, recognition of the role of the people in the face of climate change and their contribution in the innovation of conservation strategies for the Amazonia.

INNOVATION A NECESSITY TO SAVE THE AFRICAN ELEPHANT FROM ILLEGAL IVORY TRADE

Matthew Holden, Centre for Biodiveristy and Conservation Science, University of Queensland; Payal Bal, University of Queensland; Duan Biggs, University of Queensland, Henry Brink, Department of Environment and Natural Resources; Eve Mcdonald-madden, Dept Sustainability & Environ; Jonathan Rhodes, The University of Queensland

In the past decade, increased African elephant poaching for ivory has contributed to the greatest population decline since the 1989 international ivory trade ban. This has sparked contentious debates at Conventions on International Trade in Endangered Species (CITES) over the best policies to protect this iconic species. Advocates of legal ivory trade argue that increasing ivory supply through highly regulated sales will decrease ivory price and satiate consumer demand that would otherwise be satisfied by poaching and could also provide revenue to fund elephant conservation. The majority of African nations and NGOs oppose trade, and instead support actions to reduce consumer demand, such as educational campaigns and highly publicized ivory destruction events. Using a simple model of elephant population dynamics and ivory demand, we find that even with assumptions that favour the effectiveness of both legal trade and demand reduction, neither is likely to secure elephant populations at current levels, except in extreme scenarios. Demand reduction efforts need to reduce price by 80%, to prevent population declines. Legalized trade requires an unsustainable supply of ivory, even if revenue funds anti-poaching enforcement, unless demand is completely insensitive to price. We recommend shifting our focus from ivory trade policy towards developing new, innovative approaches to conserving elephants.

INSTITUTIONAL NETWORKS FOR BIODIVERSITY DATA MANAGEMENT AND FLORA CONSERVATION IN COLOMBIA

Hernando Garcia, Instituto Humboldt

Loss of plant species is in many cases a silent result of environmental change. If there is no evidence of species presence, we can hardly prove their lost, and this is a great risk in highly diverse areas. Limited information of plants species however is not always a consequence of data inexistence, instead it can result from data not been

readily available. In Colombia, flora data has been and it is produced by actors at different geographical scales, but there is a great need to secure that it is available to answers national planning and conservation questions. In this context, the Humboldt Institute in collaboration with a network of institutions is strengthening the different steps involved in the flux of production, publication and use of plant information in the framework of red listing. In this process a series of key points require to be solved, including quality and standards of the information, technological limitations, operative procedures, authors rights and users' requirements. With this aim, we have prioritized plant groups of conservation importance and also that represent working opportunities to test the proposed strategy. Collaboration among institutions is a fundamental condition to overcome challenges for the success of this network.

INTANGIBLE VALUES MEET MONETARY CONSTRAINTS: ECONOMIC IMPLICATIONS IN BIOCULTURAL CONSERVATION

Fabrizio Frascaroli, University of Bologna; Thora Fjeldsted, Lom Research

Biocultural conservation acknowledges that some livelihoods and management practices can have positive influence on biodiversity. Supporting them is thus key to conserving the biodiversity that they sustain. However, guaranteeing the reproduction of these positive relations between people and environment depends on a number of factors. Clear property rights, policies and legal frameworks are often mentioned. In contrast, economic constraints, especially at the local scale, have been greatly underplayed. This is a surprising omission, as evidence accumulates that economic unbalances can trump political checks, even when solid legal frameworks are seemingly in place. The case of many European rural areas is emblematic in this sense. Food products of high quality and tradition (e.g., olives and chestnuts from stone-walled orchards, cheese from free-range grazing) are growingly outcompeted due to plummeting prices or difficulties to access relevant market niches. Ecologically, this results in the abandonment and simplification of highly diverse cultural landscapes. Politically, it feeds resentment towards 'globalization' and consensus for 'populist' movements. To be successful, biocultural conservation projects will need to increasingly address economic criticalities of this kind. Financial incentives are only a partial response: by their nature, they do not give due consideration to the adaptive character and deep sense of meaningful interaction with the environment, which characterize traditional livelihoods. Also, they depend on tax-payers' continued willingness to pay and as such may be discontinued under different political conditions. Conservationists should rather team up with unorthodox economists and activists to test other economic instruments, such as alternative distribution networks and local currencies. Only by guaranteeing economic independence and sustainability, can projects that aim to conserve nature and culture be truly successful in the long term.

INTEGRATED TECHNOLOGY FOR IMPROVING EFFECTIVENESS OF MANAGEMENT OF POACHING IN PROTECTED AREAS

Hugo Rainey, Wildlife Conservation Society; Antony Lynam, Wildlife Conservation Society - Center for Global Conservation; Richard Bergl, North Carolina Zoo; Drew Cronin, SMART Partnership; Chris Gordon, Zoological Society of London; Jonathan Palmer, Wildlife Conservation Society - Center for Global Conservation; Emma Stokes, Wildlife Conservation Society - Center for Global Conservation

Protected areas are crucial for sustaining populations of endangered wildlife and their habitats, along with the natural resources upon which local communities are dependent. Unfortunately, many protected areas lack systems to enforce staff accountability, assess threats, or evaluate success and failure, resulting in protected areas which vary along a continuum from chaos to mature optimized processes. A broad partnership of conservation organizations developed the SMART (Spatial Monitoring and Reporting Tool) Approach to help measure management effectiveness. The SMART Approach combines standardized patrol data collection, site-based database management, and decision-making, with an emphasis on capacity building and best practices for protection. This approach, now adopted in >200 sites around the world, provides protected area managers and community groups the ability to empower staff, boost motivation, increase efficiency and promote credible and transparent monitoring of the effectiveness of anti-poaching efforts. We illustrate the utility of SMART using examples from case studies representing a range of conservation areas, from formal government protected areas to community conservation areas, in both the marine and terrestrial realms, where law enforcement monitoring has helped to improve management effectiveness, adjust strategies and enhance conservation success. Advanced features, such as adaptive management planning, intelligence monitoring, mobile data collection, and SMART Connect, a new cloud-based application allowing users to leverage real-time information sharing and centralized management capabilities, are now further improving effectiveness of anti-poaching efforts, and providing standardized measures of poaching levels and

enforcement efforts across sites critical to combatting the poaching of apes, tigers, elephants, rhinoceros, and other endangered species.

INTEGRATING ASSESSMENTS OF CLIMATE VULNERABILITY INTO SPECIES ASSESSMENTS

Iara Lacher, Smithsonian Conservation Biology Institute

The IUCN Red List provides estimates of relative extinction risk for species across the globe and is an invaluable tool for conservation biologists looking to mitigate biodiversity loss. Red List extinction vulnerability assessments are derived using a set of criteria as outlined in the IUCN Red List Categories and Criteria document. This document is periodically revised and updated to reflect ongoing technological and analytical advances. However, assessments of species extinction risk using these guidelines have not explicitly considered the threat of climate change, prompting the development of the recently published IUCN SSC Guidelines for Assessing Species Vulnerability to Climate Change. This document provides guidance for estimating climate change vulnerability using three types of approaches: Correlative, Trait-based, and Mechanistic. I will present several examples of these approaches and expand on the application of correlative methods for evaluating extinction risk of species of differing range size. I will present the results of modeling and laboratory based analyses that evaluated the climatic sensitivity of both endemic and wide-ranging plant species. Results from these studies support the idea that, when examined at a local scale, the size of a species' geographic distribution does not necessarily correlate to climate change vulnerability. Furthermore, these studies, and a growing number of related studies in the scientific literature, highlight the importance of considering species ecology prior to modeling and evaluating climate-influenced extinction risk. Access to more information and computing power will undoubtedly improve our ability to conduct meaningful risk assessments and prioritize the use of limited resources. However, for these tools to be truly effective in minimizing biodiversity loss, we must remember to contextualize their use within the context of well-developed ecological theory.

INTEGRATING BIODIVERSITY IN CONSERVATION PLANNING FOR HUMAN HEALTH AND WELL-BEING

Cristina Romanelli, Secretariat of the Convention on Biological Diversity; Catherine Machalaba, EcoHealth Alliance; Carlos Zambrana-Torrelio, EcoHealth Alliance

The continuous and rapid degradation of Earth's natural systems represents a threat to biodiversity and puts human health and well-being of present and future generations at risk. The Convention on Biological Diversity (CBD), a multilateral treaty focused on the conservation and sustainable use of biodiversity, adopted a ten-year framework for action by all countries and stakeholders to safeguard biodiversity and the benefits it provides to people, including their health and well-being. The development of national targets is a key process in fulfilling the commitments set out in the Strategic Plan for Biodiversity and its Aichi Biodiversity Targets (ABT). The CBD has identified a series of indicators to monitor progress at the global level towards the ABTs and the Sustainable Development Goals. Human health and well-being are deeply embedded in the vision, mission and targets of the Strategic Plan, most directly, through ABT 14. Yet, the mid-term review of progress has demonstrated limited progress toward ABT14, potentially jeopardizing the conservation of ecosystem services fundamental to health and well-being, through the provision of food, freshwater and medicines and through its regulatory functions, such as climate and disease regulation. Conservation tools and initiatives such as the Red List for Ecosystems, the Red List Index (RLI) for Pollinators and the RLI for food and medicine can be central to meeting our global commitments. Development of integrated methods for assessment of status of natural and human resources within an ecosystem can enable better planning and implementation to meet these objectives. Maximizing synergies at this intersection can also better harness the potential of scarce natural, financial and human resources to maximize health and biodiversity co-benefits. This session will explore challenges and opportunities for pragmatic, scalable and interdisciplinary policy solutions to support health and well-being.

INTEGRATING CLIMATE CHANGE IN FISHERIES SUSTAINABILITY IN NORTHERN SOUTH AMERICA RIVERS

Silvia López-Casas, The Nature Conservancy; Hector Angarita, The Nature Conservancy; Eduin H. Serna, DILE Predictive Analytics

Tropical freshwater fisheries are based in migratory fish, manly potamodromous species. In the Magdalena Basin, as in all the large basin of South America, they present highly seasonal spawning migrations associated with the flood pulse of the rivers. To understand some of the inter-annual fluctuations in catch, hydrological data, climatic change scenarios and data from artisanal fisheries of the Magdalena Basin were modelled using a predictive model. Fisheries data came from field in La Miel River basin (a middle-sized basin bellowing Magdalena Basin) for 2008-2009, and from SEPEC (Servicio Estadístico

Pesquero Colombiano) for 2013-2016. Hydrological and climatic change scenarios data of the basin was supplied by IDEAM-TNC agreement. Our results point that fisheries in Magdalena River and its tributaries are sustained by potamodromous species the Prochilodus magdalenae being the most important species for fisheries. Inter-annual fish abundance, fish biomass and migratory timing were related to regional rain patterns and the changes in the hydrological conditions imposed by ENSO cycles. Understanding the effects of ENSO cycles is very important, especially when climatic change scenarios are taken in mind. For Colombia, the IDEAM forecast an increase in the frequency of occurrence of such events and in its magnitude. In other words, it is expected that in the next years we will see more of these ENSO cycles and each time being extreme: longer and stronger droughts and floods. This phenomenon could have serious impacts in potamodromous fish populations and its based the fisheries, as well as for the fisheries management. With our model is easy to share this information so it could be used as a tool for environmental education with fishermen and stakeholders.

INTEGRATING CLIMATE RISK AND REFUGE INTO CONSERVATION PORTFOLIOS FOR INDO-PACIFIC CORAL REEFS

Emily Darling, Wildlife Conservation Society; Indo-Pacific Collaboration, Multiple organizations; Marie Josee Fortin, University of Toronto; Joseph Maina, Macquarie University; Timothy Mcclanahan, Wildlife Conservation Society; David Mouillot, Université Montpellier

Climate change is an unprecedented threat to global coral reefs. Urgently, innovative solutions are needed to identify portfolios of conservation investments that can be appropriately matched to predictions of climate risk and refuge. Here, we present a collaborative dataset of Indo-Pacific coral communities to identify data-driven portfolios of conservation actions across gradients of biodiversity and climate exposure. These portfolios identify priority locations for conservation under different scenarios of climate risk and refuge, such as marine reserves that can be prioritized to areas of high biodiversity within climate refuges, or locations that require economic relief and reorganization with low biodiversity and intensifying climate exposure. We also consider the ecological connectivity of these portfolios, and where 'stepping stone' investments can strengthen larger networks of conservation actions. Overall, we show that data-driven frameworks to integrate biodiversity, climate exposure and connectivity across multiple scales can provide innovative decision tools for designing climate-smart conservation for coral reefs.

INTEGRATING SES AT SMITHSONIAN-MASON SCHOOL OF CONSERVATION & SMITHSONIAN CONSERVATION COMMONS

Kate Christen, Smithsonian Conservation Biology Institute

Hopefully in a way complementary to other talks in this symposium, mine does not address a specific Socio-Ecological Science (SES) project or program, nor does it focus on the SES experiences of a particular environmental NGO. Instead my talk today primarily reflects upon some related training experiences here at the Smithsonian-Mason School of Conservation (SMSC) since about 2009, with some additional context in prior Smithsonian conservation training dating back to the early 1980s. The School of Conservation provides practice-oriented capacity building in conservation science and allied fields through professional, graduate, and undergraduate courses ranging from three days to three months long. Our course participants come from--or are later bound for--environmental NGOs, as well as research institutions, government agencies, and other key loci in the conservation world. In those places, almost inevitably, they are now or will become daily immersed in the work of engaging, enacting, and just plain wrestling with social-ecological science integrations, experienced as components of the endeavor to achieve effective, ethical, and sustainable conservation policy and practice. My talk explores both our direct training content and the life-changing cohort experiences our courses virtually always engender, related foci which together cast light upon the strengths and the difficulties of enacting social-ecological science to support real-world conservation aims. I also reflect upon some topical links between our SMSC training portfolios and the new pan-Smithsonian initiative, the "Conservation Commons," including the (vast and) necessarily integrative subjects of sustainable food systems, movement of life, and changing land and seascapes.

INTEGRATING SOCIAL AND ECOLOGICAL FACTORS IN ENVIRONMENTAL DECISION MAKING

Kerrie Wilson, The University of Queensland

Effective conservation needs to inclusive of ecological, social, and economic considerations. This is particularly important in post-conflict areas. The unified nation of Colombia, for example, has the incredible opportunity and responsibility to implement a social economic, and environmentally-friendly post-conflict development plan. Importantly, this plan could also establish a benchmark for other nations currently in the process of resolving internal armed conflicts. This talk will profile recent

research demonstrating the value of integrating economic and conservation targets, and revealing the significant opportunity cost savings that can be delivered through an integrated approach to conservation. Furthermore, it will be demonstrated how we can ensure greater target achievement and deliver a greater return-on-investment by being explicit about stakeholder attitudes towards risks in the development of conservation plans. Systematic and structured approaches to conservation planning are particularly important when resource extraction can potentially generate tension, such as in developing countries like Colombia, where the competition between different land uses has the potential to negatively impact conservation investments. This talk will thus reveal strategies of great relevance to the post-conflict situation in Colombia and inform how spatial data on biological, economic, and social factors can be integrated to identify priority locations for cost-effective conservation interventions.

INTEGRATING VISION AND TENACITY TO ADVANCE AND APPLY SCIENCE

Erica Fleishman, Colorado State University

In the context of this symposium, I define scientific leadership as application of the scientific method to generate information that meets the objectives of end-users and can be discovered and employed by others. This process often requires evaluation of trade-offs between statistical rigor and ecological or sociological realism, and it demands organizational skills, clear communication, and intellectual honesty. Specification of objectives generally entails iterative discussion with those whose decisions will be informed by science, and acceptance that decisions may not be based primarily on science. Quantitative methods and computing power have advanced far and rapidly, but the inferences they facilitate are constrained by environmental variability and data gaps. Ensuring ecological or sociological realism means that, perhaps to the chagrin of some businesses, detailed methods may not be widely transferable. Publication and data archiving allow research to be evaluated and applied by others. Moreover, although peer-reviewed publication is an imperfect enterprise, it maximizes scientific legitimacy and transparency. Recognizing distinctions between marketing and science, and eschewing jargon, maintains candor and accessibility of science. Treating scientific partners and end-users equitably and equally also is imperative. Because most contemporary science is multidisciplinary and conducted by teams, adhering to fundamental principles of leadership also is essential. These principles include self-awareness, technical proficiency, follow-through, and responsibility. Realizing a vision rarely is a glamorous endeavor, but the rewards can include enduring friendships and societal trust in science and scientists.

INTEGRATING, MORPHOLOGY, PHYSIOLOGY, AND GENOMICS TO IDENTIFY SOURCE POPULATIONS FOR RE-INTRODUCTION

William Chris Funk, Colorado State University; Maybellene Gamboa, Colorado State University; Cameron Ghalambor, Colorado State University; Scott Morrison, The Nature Conservancy; T. Scott Sillett, Smithsonian Institution Migratory Bird Center

An important consideration when re-establishing an extirpated population is assuring that the source population is adapted to the target environment. Genomics can elucidate patterns of adaptive differentiation, and therefore has the potential to help identify the most appropriate source for re-introduction. The U.S. National Park Service is proposing to re-introduce Channel Islands song sparrows (*Melospiza melodia graminea*) to Santa Barbara Island off the coast of southern California, where the local population went extinct in the early 1960s. Potential sources include extant populations on three northern Channel Islands, which vary dramatically in temperature. To inform the best source for this reintroduction, we are testing: (1) whether song sparrows on these islands are genetically differentiated; (2) whether they are adapted to the local climate; and (3) if so, which source population is best matched to the current and projected future climatic conditions on Santa Barbara Island. Landscape genomic analysis of 2,767 single-nucleotide polymorphism (SNP) loci uncovered high genetic differentiation among islands. Song sparrows also had larger bills on hotter islands, which is hypothesized to be adaptive for heat dissipation. Preliminary heat-stress experiments also suggest birds on hotter islands can tolerate warmer temperatures. Finally, FST outlier tests and genotype-environment association analyses of the SNP data detected a genomic signature of adaptive differences among islands. Together, these results provide strong evidence for adaptive divergence. The next step will be to identify which of the extant populations are most closely adapted to the climate of Santa Barbara Island by examining genomic and phenotypic variation of Santa Barbara Island museum specimens. Integrative approaches for quantifying adaptive differentiation among potential source populations, as illustrated here, are an important first step for successful reintroductions.

INTERACTING WITH TRADITIONAL INSTITUTIONS ON NATIVE SACRED PLANTS: CASE STUDY IN NIGERIA

Temitope Israel Borokini, University of Nevada

Traditional institutions, medicinal practitioners, herb sellers and collectors have a repository of indigenous ecological and ethnomedicinal knowledge in Nigeria; but due to increasing influence of western civilization on these cultures, generational transfer of unwritten knowledge is highly threatened. Previous cooperation between indigenous peoples and researchers led to publication of several articles documenting ethnomedicinal and ecological knowledge in various parts of Nigeria in the last two decades. But recently, this collaboration is plummeting, partly due to copyrights and frequent clashes with government agencies on land ownership; while access to sacred sites is at best equivocal in different regions. In my previous studies on ethnomedicinal plant research, I enjoyed cooperation from indigenous respondents who also introduced me to their colleagues for further assistance. This may be due to initial familiarization visits, patronizing their products as a form of compensation and communication with them in local language in an informal setting. Though, in a separate field survey to collect Okoubaka aubrevillei samples in Cross River State, south-southern Nigeria, I was refused access to sacred tree in spite of going through a member of the community. This could have been due to language barrier, non-familiarization and strong religious laws protecting the tree. I later learnt that persistent visits and offering to pay libations would have paved way for access to the tree. Conclusively, interacting with traditional religious communities requires different approaches depending on the strength of religious laws, and persons or community involved. However, trust-building familiarization visits, respect for their traditions, good demeanor, common language and compensation are often keys to successful interactions, upon which further collaborative research or conservation efforts are built.

INTERROGATING CONTEMPORARY DEBATES ABOUT THE ROLE OF POVERTY ALLEVIATION IN CONSERVATION

Janet Fisher, University of Edinburgh; Hari Dhungana, Southasia Institute of Advanced Studies; Jun He, Yunnan Agricultural University; Mirna Inturias, NUR Bolivia; Ina Lehmann, University of Bremen; Adrian Martin, University of East Anglia; David Mwayafu, Uganda Coalition for Sustainable Development; Iokine Rodriguez, University of East Anglia; Helen Schneider, Fauna and Flora International

While a number of conservation organisations portray generalised 'win-wins' between people and nature, this paper interrogates how diverse conservation representatives consider whether and what role poverty alleviation should take in conservation action. Many conservation interventions continue to take place in settings characterised by entrenched poverty and, in the presence of ecological and social trade-offs, conservation benefits do not automatically benefit poor people, but often accrue to better-off and more powerful actors. Hence, questions about poverty objectives in conservation are important. They are also timely because they take place in a context of active debates about the 'new conservation' and conservation ethics. A number of normative principles about human rights and equity are becoming enshrined in high level conservation agreements, but as yet it is unclear how such commitments are reflected in practice. In this paper, we approach these questions with in-depth interviews and a Q methodology study, which enables us to discern key differences between perspectives about poverty in these debates. There is a strong divergence in perspectives about poverty, from outright rejection of the idea that poverty alleviation is a legitimate conservation objective, to a very instrumental consideration in other quarters, to strong commitments to actual pro-poor governance of natural resources being advocated elsewhere. This paper examines these divergences in light of different political philosophical rationales for governing resources in favour of poorer groups, and seeks to explain the divergent perspectives and uses them to reflect on the future of conservation's interaction with people in the tropics.

JOINING SCIENCE AND STORYTELLING TO COMMUNICATE RESEARCH ON YELLOWSTONE NATIONAL PARKS GRAY WOLF

Kira Cassidy, Yellowstone Forever; Douglas Smith, Yellowstone Wolf Project, NPS

Rarely have two species been as intertwined in their evolutionary history as Homo sapiens and Canis lupus. Between overlapping ranges, a preference for many of the same prey species, and the domestication of some wolf ancestors to create humans' favorite companion—the domestic dog – the two species share a rich and turbulent past. During the European settlement of the United States, attitudes toward wolves were intensely negative and resulted in the near eradication of gray wolves from the lower 48 states and complete elimination from the American West, including Yellowstone National Park by 1926. Nearly seven decades later, wolves were reintroduced to Yellowstone by the US Fish and Wildlife Service in 1995-1997. This effort surfaced diverse opinions

about gray wolves, ranging from hatred to adoration and everything in between. For 22 years, scientists in Yellowstone have been working to uncover the truth about gray wolves through scientific data-collection. Communicating this information is of great importance to promoting fact-based attitudes and decision-making. The Yellowstone Wolf Project (YWP), which oversees wolf research and communication under the National Park Service, also recognizes that wolves can be an important tool in achieving broader conservation goals. As part of these efforts, YWP staff has developed a wide range of strategies for presenting information to engage audiences from all backgrounds and disciplines, including the use of visuals, interactive activities, social media, and storytelling. Since 2011, YWP staff has given 1,374 formal talks, 2,870 informal field talks, and had contact with over 80,000 visitors. The interviews and presentation videos they have produced are available on sites like Great Wide Open and TEDx. Communicating scientific research and results have helped to disseminate information in a way that is understandable and enjoyable, with the ultimate goal of fostering appreciation for ecosystems, conservation, and science.

KEY BIODIVERSITY AREAS FOR INVESTMENT IN THE TROPICAL ANDES

Healy Hamilton, NatureServe; Leslie Honey, NatureServe; Carmen Josse, EcoCiencia Foundation; Regan Lyons Smyth, NatureServe; Bruce Young, Natureserve

The Tropical Andes Hotspot comprises the Andes Mountains from Venezuela and Colombia to the northern portions of Argentina and Chile. Because threats to biodiversity are immense in comparison to available conservation resources, allocation of investments must be prioritized. In 2013, the Critical Ecosystem Partnership Fund (CEPF) funded NatureServe, in collaboration with EcoDecisión, to develop a Tropical Andes Hotspot profile and investment strategy. CEPF provides grants that target biodiversity hotspots in developing and transitional countries. CEPFs Tropical Andes Hotspot investment enables local indigenous, Afro-descendent, mestizo, and environmental civil society groups to effectively advocate for and facilitate multi-stakeholder approaches that promote biodiversity conservation and sustainable development. To date CEPFs investment in the region exceeds $18M. NatureServe is an international conservation nonprofit who with our network of 80 programs gather and maintain a unique body of detailed scientific information and expertise about the plants, animals, and terrestrial ecosystems of the Americas. NatureServe compiled and analyzed a wide array of information related to the hotspot's conservation, threats and opportunities. The team then traveled to each of the seven Andean countries to hold workshops and to meet with more than 200 key stakeholders. This work resulted in confirming a total of 429 terrestrial KBA sites, which include 337 Important Bird Areas (IBAs), 116 Alliance for Zero Extinction (AZE) sites, 6 new KBAs, and 13 candidates for KBA status. The KBAs cover 33.2 million hectares, or about one-fifth of the hotspot, an area slightly smaller than the size of Paraguay. Issues of data availability limited the outcome in several respects. Most notably, only mammals, birds, and amphibians had been comprehensively assessed for their global threat status for IUCN Red Listing. Some reptiles, fish and plants have been assessed but many large gaps remain.

KEY PRINCIPLES FOR DEVELOPING A STANDARD FRAMEWORK TO MANAGE SPATIAL CONSERVATION INFORMATION

Nick Salafsky, Foundations of Success; Lilian Pintea, the Jane Goodall Institute

The pilot case studies presented in this symposium have illustrated both the need for and the power of developing a standard framework to convert spatial data pixels into meaningful conservation management information. Key principles that have emerged from this pilot work include: 1) An adaptive management approach like the Open Standards for the Practice of Conservation can help convert remote sensing data pixels into management information polygons. This conversion requires understanding what the key management decisions are, and then working backwards to determine the specific data needed to inform these decisions and providing standard analyses that interpret these data. 2) To this end, it is extremely powerful to combine Open Standards conceptual tools with spatial maps, using the map to manage spatial heterogeneity and complexity. 3) A common and shared data framework also means that these critical data sets only need to be collected once across the conservation community, which greatly enhances both the efficiency and scope of data collection, as well as the potential for coordination and collaboration across the community of both implementing and funding agencies and organizations. We believe that the key to taking this pilot framework to scale involves bringing together small groups of the right actors who can develop spatial conservation data standards for their own use that are then shared under an open-source intellectual property agreement and adopted by the wider community. It is our hope that this symposium will convince you to join this work.

KNOWLEDGE CO-PRODUCTION WITH PALM OIL SUPPLY CHAIN IN CAMEROON

John Garcia Ulloa, ETH Zurich; Jaboury Ghazoul, ETH Zurich; Anne Dray, ETH Zurich; Eglantine Fauvelle, CIRAD; Claude Garcia, ETH Zurich, CIRAD; Durrel Halleson, WWF Cameroon; Patrice Levang, Institut de recherche pour le développement, IRD; Emmanuel Ngom, Ministère de l'Agriculture et du Développement Rural Cameroon

Considerable inefficiencies in the palm oil sector in Cameroon has impacts on local and national economies, as well as on the environment through increased forest loss. Through the Oil Palm Adaptive Landscapes project (OPAL) we have been working with local producers to develop an understanding of the constraints acting on smallholder supply chains in Cameroon. We initially solicited information from local experts on currently perceived inefficiencies in the palm oil milling sector. Using this information we built a model of the system that was further developed into a palm oil supply chain role-playing game (CoPalCam) using the Companion Modelling approach. The CoPalCam game was tested with experts and then validated with local smallholder producers to better understand the constraints and drivers shaping supply chain inefficiencies. The game was subsequently used to engage the inter-ministerial committee regulating the palm oil sector in Cameroon, as well as experts from Cameroon's Union of Oil Palm Producers. The gaming process revealed new insights into smallholder decision making and options for the future resolution of current conflicts that underlie the supply chain inefficiencies. Importantly, the CoPalCam game proved highly effective in engaging a variety of stakeholders in the research process, leading to a much greater awareness among policy makers of existing constraints. This process has therefore not only generated new knowledge, but has also facilitated the construction of a shared understanding of the constraints affecting the oil palm sector in Cameroon. Role-playing games have the potential to effectively link research and practice by providing transdisciplinary platforms for non-conflictual exchange and discussion of research ideas and outputs. By creating a shared understanding of a complex situation, these platforms can elicit innovative and effective solutions to sustainability and conservation problems. The process is iterative and and ongoing.

LAND ACQUISITIONS FOR CONSERVATION: DRIVERS OF SPATIAL ALLOCATION IN THE USA CHILE AND COLOMBIA

Christoph Nolte, Boston University

Land acquisitions are a key instrument in the conservationist's toolbox. Over the past decades, organizations and individuals spent billions of dollars to protect habitats through the purchase or donation of full or partial land rights. Their importance is bound to increase, as climate change pushes species outside existing reserves, while public park creation has stalled in many countries. Conservation planning has a long history in designing methods for optimal site selection. Yet, real-life acquisitions seldom occur in "optimal" ways. Although discrepancies between planning and reality are well documented, scholars rarely explain why they exist and persist. A more rigorous assessment of the drivers and impacts of land acquisitions is key to understanding where acquisitions occur, why, and what difference they make. This presentation examines the spatial drivers of the allocation of permanent land protection in the USA, Chile, and Colombia. All three countries have experienced a significant growth in private land protection over the past two decades. In all three countries, conservation planners have helped prioritize locations of particular importance for the conservation of ecosystem services and biological diversity. We develop and analyze three parcel-level datasets to quantify the extent to which land acquisitions are shaped by ecological priorities - including species presence, threats, and cost - vs. other relevant factors observable from space, such as accessibility and scenic appeal. We also estimate impacts of land acquisitions on the conversion of natural ecosystems to human-dominated land uses over the last 15 years, using a quasi-experimental strategy for causal inference. In bringing together new evidence on the spatial allocation and impact of land acquisition in three distinct geographies, our work informs a wider debate on the role that land acquisitions can play in enhancing the protection of natural ecosystems.

LANDSCAPE HETEROGENEITY EXPLAINS THE OCCURRENCE OF A FRUGIVOROUS MARSUPIAL AT EXOTIC PLANTATIONS

Daniela Salazar, Universidad de Chile; Francisco Fonturbel, Pontificia Universidad Catolica De Valparaiso

Habitat structure determines species occurrence and behavior. However, human activities are altering natural habitat structure, potentially hampering native species due to the loss of nesting cavities, shelter or movement pathways. The South American temperate rainforest is considered as a biodiversity hotspot due to its high endemism levels, and currently is experiencing an accelerated loss and degradation, compromising the persistence of many native species, and particularly of the monito del monte (*Dromiciops gliroides*), an arboreal marsupial that plays a key role as seed disperser. The study was conducted in a complex habitat mosaic (a

native old growth and secondary-growth native stands and a transformed habitat, composed by abandoned Eucalyptus plantations with abundant native understory and surrounding vegetation). Aiming to compare these contrasting habitats, we assessed *D. gliroides*' occurrence using camera traps and measured several structural features (e.g., shrub and bamboo cover, deadwood presence, moss abundance) at 100 camera locations. Complementarily, we used radio telemetry to assess its spatial ecology, aiming to depict a more complete scenario. Moss abundance was the only significant variable explaining *D. gliroides* occurrence between habitats, and no structural variable explained its occurrence at the transformed habitat. There were no differences in home range, core area or inter-individual overlapping. In the transformed habitats, tracked individuals used native and Eucalyptus-associated vegetation types according to their abundance. Diurnal locations (and, hence, nesting sites) were located exclusively in native vegetation. The landscape heterogeneity resulting from the vicinity of native and Eucalyptus-associated vegetation likely explains *D. gliroides* occurrence better than the habitat structure itself, as it may be using Eucalyptus-associated vegetation for feeding purposes but depends on native vegetation for nesting.

LANDSCAPE-SCALE CONSERVATION AND MANAGEMENT OF PROTECTED AREAS IN ECUADOR

Galo Zapata-Rios, Wildlife Conservation Society Ecuador Program; Fernando Anaguano, Wildlife Conservation Society Ecuador Program; Isaac Goldstein, Wildlife Conservation Society Andean Bear Conservation Program; Adrián Naveda-Rodríguez, Wildlife Conservation Society Ecuador Program; Jaime Palacios, Wildlife Conservation Society Ecuador Program

Given current human population growth, protected areas are unlikely to save more than a fraction of biodiversity because they are too small, isolated and undergoing anthropogenic change. In the short term, wildlife persistence in the Amazon–Andes interface will depend on the conservation of human dominated lands. Improved knowledge about wildlife persistence, not only in natural vegetation remnants but also along a gradient of disturbance, will greatly increase the scientific foundation for conservation in landscapes dominated by human activities. We developed a survey design for medium- and large-mammals (> 1 kg), using camera traps and track-and-sign surveys, for estimating occupancy rates and evaluating the main factors that determine presence and persistence of these species at the landscape scale in two national parks in the Amazon–Andes region of Ecuador: LLanganates and Yasuní. Between July 2015 and August 2016, we carried out presence-absence surveys of large mammals, and examined the influence of variables related to habitat loss and fragmentation, hunting, presence of exotic species, and prey availability. As a result, we have surveyed 1552 km2 and generated baseline information containing 3822 independent detection events (with cameras and along trails) of 43 species that will be used in a landscape-scale monitoring program that will inform conservation actions and management decisions for protected areas and their surrounding areas. We also have a better understanding of species distribution along the altitudinal gradient of the study area (200 – 4100 m). At the same time, the Ministry of the Environment of Ecuador is applying the same methodology in six additional protected areas. Wildlife surveys information will be critical for increasing the area, connectivity, and range of conditions represented in protected areas, and will help understand the impacts of habitat loss, fragmentation, hunting, and invasive species.

LAND-USE CHANGE AND DIRECT THREATS AS DRIVERS OF JAGUAR AND PUMA HABITAT LOSS IN THE GRAN CHACO

Alfredo Romero-Muñoz, Humboldt University-Berlin; Matthias Baumann, Geography Department, Humboldt University-Berlin; Micaela Camino, Centre of Applied Ecology of the Litoral Region, CECOAL and CONICET, Argentina; Julieta Decarre, Instituto de Recursos Biológicos, INTA, Argentina; Anthony Giordano, S.P.E.C.I.E.S.; Bibiana Gomez-Valencia, Departamento de Ecologi´a, Gene´tica y Evolucio´n, Universidad de Buenos Aires; Tobias Kuemmerle, Geography Department, Humboldt University-Berlin; Andrew Noss, Department of Geography, University of Florida; Jeffrey Thompson, Consejo Nacional de Ciencia y Tecnología, CONACYT, Asunción, Paraguay; Ricardo Torres, Instituto de Diversidad y Ecología Animal, Universidad Nacional de Córdoba

Large predators are threatened across the globe due to a combination of habitat loss, caused primarily by land-use change, and direct elimination, often in response to human-wildlife conflicts. The spatial interactions of both threats are little understood, but likely involve large synergistic negative effects on populations. Here, we evaluated how land-use change and surrogates for direct human persecution have changed in the Gran Chaco ecoregion (1.1 million km²) between 1985 and 2013, and how these changes have affected suitable habitat for jaguar (*Panthera onca*) and puma (*Puma concolor*). We collected georeferenced records for both species over the last four decades across the Chaco from Argentina, Paraguay and Bolivia. We applied a two-dimensional

habitat modelling approach to separate the effects of land-use change and of direct persecution by humans; and to map core, sink, and refuge areas for our target species. We found that the jaguar has experienced the greatest decline of high quality habitat, especially towards the south of its range in the Argentine Chaco, but also in Paraguay where agricultural expansion has boomed recently for cattle ranching. Core habitat shrank to a few patches in the northern Chaco-in southern Bolivia and western Paraguay- and was virtually lost from the entire Argentine Chaco, which now appears to contain only sink habitat. The puma has experienced a more moderate decline, maintaining high quality habitat patches in large areas of the Chaco in all three countries. However, similar to jaguars, pumas have experienced a loss of core habitat and a widespread increase of sink and refuge habitat. The Chaco, a global deforestation hotspot, is a large and unique ecoregion, but our analyses show that it is losing its apex predators rapidly and across large areas due to the expanding threats of land-use change and predator persecution.

LAND-USE PRACTICES INFLUENCING HUMAN-LEOPARD CONFLICTS IN A HUMAN-DOMINATED LANDSCAPE

Arash Ghoddousi, Humboldt-Universität zu Berlin; Delaram Ashayeri, Freelance researcher; Benjamin Bleyhl, Humboldt-Universität zu Berlin; Tobias Kuemmerle, Humboldt-Universität zu Berlin; Peyman Moghadas, Freelance researcher; Pooriya Sepahvand, Persian Wildlife Heritage Foundation; Clara Sichau, Humboldt-Universität zu Berlin

Livestock depredation by large carnivores and consequently, retaliatory persecution by humans, are among the oldest interactions between humans and wildlife in agricultural landscapes. Such conflicts are anticipated to increase in the future as more landscapes around the globe become human-dominated due to agricultural expansion and intensification. Despite the role of conflict in the extirpation of many large carnivores in different parts of the world, the influence of land-use change as a potential underlying driver of these conflicts has been poorly studied. We assessed the spatial patterns of human-carnivore conflict in relation to a number of environmental and anthropogenic variables, including land-use, in Golestan Province, Iran. Our study area (3,325 km2) is located in the Eastern Alborz Mountains and is home to one of the last population strongholds of the endangered Persian leopard *Panthera pardus saxicolor*. The landscape's natural vegetation, mainly deciduous Hyrcanian forest, has been converted at a high rate to urban and agricultural land uses in recent decades. We used 231 interviews with local communities in 69 6x6 km grids to collect data on the occurrence of human-leopard conflict, and observations of leopard and different prey species in the prior year. To assess the spatial patterns of land-use, we used Landsat 8 satellite images and a Random Forest algorithm to classify six land cover/use types. The human-leopard conflict was reported in 32.8% of the sampled grids. We also found that the probability of human-leopard conflict was increasing with higher levels of deforestation and the more fragmented remaining of forests. Our results indicate the importance of landscape configurations in predicting human-carnivore conflict. Adoption of conflict mitigation measures, control of deforestation, and smart landscape planning that avoids conflict-prone landscape configurations will benefit the conservation of leopards and large carnivores in general.

LEARNING TO CONDUCT ECOLOGICAL RESTORATION TOGETHER: NON-PROFIT & TRIBAL COLLABORATION IN ILLINOIS

David Ostergren Goshen College; Kaitlyn Bradley, Goshen College

How do western trained restoration ecologists and people who hold Traditional Ecological Knowledge (TEK) collaborate to conduct more holistic restoration? A promising number of organizations and federal agencies work with tribes in the USA, but many are still unfamiliar with TEK, or have not addressed perceived obstacles to collaboration. Utilizing information from surveys and interviews, the PIs seek to help organizations understand how to build relationships for collaboration. In Jo Daviess County, NW Illinois, native peoples have dwelt, traded, and traveled along the Mississippi River for millennia. Sacred effigy and burial mounds claimed by the Ho Chunk Nation still exist on private and publicly owned lands. The nonprofit Jo Daviess Conservation Foundation (JDCF) has found close to 100 effigy and burial mounds on five separate properties. Although JDCF has several properties that honor and highlight effigy mounds, they had not worked collaboratively with the Ho Chunk Nation. This presentation discusses how a workshop informed the JDCF board who moved to collaborate with the Ho-Chunk Nation on a management plan for a new piece of property. With the Ho Chunk Nation taking a leading role, JDCF was able to make connections across cultures, recognize sacred space, and redesign the approach of a management plan for a new property on the Mississippi River in northern Illinois.

LESSONS FROM THE WILD WEST: BENCHMARKING BIODIVERSITY IN THE GREAT WESTERN

David Watson, ILWS, Charles Sturt University; Allan Burbidge, Department of Parks and Wildlife; Michael Craig, University of Western Australia; Tegan Douglas, Birdlife Australia; James Fitzsimons, The Nature Conservancy; Elizabeth Fox, Birdlife Australia; Carl Gosper, CSIRO; Anthony Nicholls, Charles Sturt University; James O'Connor, Birdlife Australia

The Great Western Woodland occupies 16 million hectares in the remote southern region of Western Australia, comparable in extent to the state of Florida or the nation of Uruguay. As the largest temperate woodland on earth and one of the most extensive intact terrestrial ecosystems, it represents a unique opportunity to benchmark how intact communities function. In a collaboration between Birdlife Australia and The Nature Conservancy, 4,474 bird surveys were conducted by hundreds of skilled volunteers across 231 sites, guided by an expert technical advisory group. Seven functional groups and 76 individual species (of 182 species recorded) were analysed, with just nine species showing declines over the 37 years of data. Vegetation type and fire history interacted to create a complex mosaic across the region. Nomadic species like nectarivores tracked large-scale changes in resource availability across hundreds of kilometres. In contract, many insectivores were relatively sedentary, several species most frequently recorded in areas 200–300 years since the last fire. Although presently intact and relatively undisturbed, increased mining activity is encroaching on the woodland margins and large-scale mining exploration is occurring throughout the region. Rather than identifying refugia, prioritizing critical habitats or significant areas based on current or projected quality, we determined that the key conservation attribute of the Great Western Woodlands was its overall size. Working closely with agricultural and mining interests to minimise future disturbance are critical management objectives, with citizen scientists involved in data collection ideal ambassadors to engage the wider community. Looking further afield, large-scale connectivity with the wheatbelt and southwest forests will become increasingly critical, this continuous woodland providing an interconnected suite of resources to buffer projected bottlenecks associated with climate change.

LESSONS LEARNT FROM ASSESSING THE FLORA OF A MEGADIVERSE COUNTRY

Domitilla Raimondo, SANBI

South Africa as a signatory party to the Convention on Biological Diversity (CBD), is committed to working to achieve Aichi Biodiversity Strategy'sTarget 12, on avoiding the extinction of threatened species. In addition, South Africa has developed a National Strategy for Plant Conservation and is working to achieve the CBD's Global Strategy for Plant Conservation (GSPC) Target 2 of: An assessment of the conservation status of all known plant species, as far as possible, to guide conservation action. With 6% of the world's plant diversity and strong botanical and conservation capacity, South Africa is well placed to make a significant contribution to plant conservation globally. South Africa's Strategy for Plant Conservation is nationally relevant and aligns with and is incorporated into South Africa's updated National Biodiversity Strategy and Action Plan (NBSAP). South Africa is to date the only megadiverse country to have comprehensively assessed all plant taxa (20 500 taxa) and to achieve Target 2 of the GSCP. As part of the red listing process plant occurrence data from herbaria collections have been digitised and georeferenced. Specimen data has been combined with field monitoring and citizen science observations to provide accurate spatial data that is actively being used to influence land use decision making and protected area expansion planning. South Africa has been conducting country level exchanges with Brazil since 2010, Colombia since 2013 and Mexico since 2016 to share lessons in Red Listing. These exchanges have provided a platform to support one another to develop information systems to manage occurrence data and facilitate accurate red list assessments. These four countries are now in the process of forming a technical alliance for species conservation in Megadiverse countries and are engaging through the IUCN's Species Survival Commission to ensure that these lessons are shared more widely with other countries embarking on species red listing.

LEVERAGING GRADUATE STUDENT INTEREST AND AGENCY NEEDS FOR CLIMATE CHANGE PLANNING

Mark Schwartz, University of California

State and Federal agencies within the U.S., as well as conservation NGO's, are struggling to integrate climate change into natural resource planning. Partnering with Universities provides an opportunity for these conservation organizations to garner much needed information synthesis for planning. I n parallel, graduate students are curious about how agencies and NGO's function and have an interest in developing ties with these groups to better understand their functioning. I report on a series of four projects where small groups of 3-8 graduate students have partnered with agencies

(US Fish and Wildlife Service, The Nature Conservancy) to provide climate change vulnerability assessments for refuges or ecosystems of particular concern to these conservation partners. Embedded as part of the UC Davis Conservation Management program, students partner with agency representatives to develop a specialized product that fits a specific need for particular kinds of vulnerability assessments. As a consequence, each vulnerability assessment is unique and follows unique protocols. These assessments include examining habitat sensitivity in Humboldt Bay National Wildlife refuge, Desert spring-dependent species vulnerability at Ash Meadows National Wildlife refuge; species of special concern for focal California ecosystems with The California Nature Conservancy; and assessing critical locations for fire management with the National Park System. Results of these vulnerability assessments range from highly to marginally vulnerable species and ecosystems, with high and relatively low uncertainty. The critical factor in each case, however, was timely partnering with organizations actively planning agency actions. The consequence is a key training and networking opportunity for students in translational science. We summarize the value of the experience garnered by students and the agencies using a brief post-project survey.

LINKING BIODIVERSITY IMPACT TO GLOBAL SUPPLY CHAIN ACTORS: THE CASE OF SOY PRODUCTION IN BRAZIL

A. Paz Durán, University of Cambridge; Andrew Balmford, University of Cambridge; Duan Biggs, Griffith University; Neil Burgess, UNEP-World Conservation Monitoring Centre; Simon Croft, Stockholm Environment Institute; Edegar de Oliveira Rosa, World Wide Fund for Nature, WWF - Brazil; Toby Gardner, Stockholm Environment Institute; Jonathan Green, Stockholm Environment Institute; Angela Guerrero Gonzalez, University of Queensland; Malika Virah-Sawmy, Luc Hoffmann Institute; Chris West, Stockholm Environment Institute

Managing the biodiversity impacts of land use change for agricultural production remains a challenging task. Agricultural commodities are often traded via complex and opaque international supply chains in which the roles and responsibilities of the multiple actors involved are unclear. Scientific advances over the last decade, however, hold much promise for the governmental, not-for-profit and private sectors trying to understand and address this challenge. For instance, advances in spatial models and databases now allow researchers to explore causal relationships between land conversion and biodiversity changes, whilst integration of production and trade data into financial flow models is providing new insights that enable consumption in one place to be linked to its production in another, identifying the key supply chain actors in between. Qualitative methods are also aiding our understanding of the perceptions and mental models of key stakeholders - a traditionally-overlooked component that it is now widely recognised for effective program intervention. While these approaches hold potential to support more sustainable supply chains, it remains unclear how their insights can be integrated for the production of relevant knowledge and actionable research outputs for multiple sectors and disciplines. We will show how, accounting for the needs of end users, we have combined these three components to identify solutions to the biodiversity impact of the soy industry in Brazil. To achieve this, we relied on three key principles. First, explicit consideration of stakeholders' feedback in the design of research and tool outputs. Second, active and iterative interaction between project scientists and stakeholders throughout the project. Third, an adaptive approach to research design. We discuss the challenges we have faced as well as the opportunities and successes.

LOCAL COMMUNITIES' PERCEPTION ON PROTECTED AREA MANAGEMENT: CASE OF YANKARI GAME RESERVE, NIGERIA

Tuyeni Mwampamba, Universidad Nacional Autonoma de Mexico; Salamatu Fada, Bangor University; Bauchi State Government; Danlami Garba, Bauchi State Government, Nigeria; Matt Hayward, Bangor University; Tuyeni Mwampamba, Universidad Nacional Autonoma de Mexico; Andrew Pullin, Bangor University

West African protected areas are faced with many threats including, human – wildlife conflicts, human population expansion surrounding the protected areas, and agricultural expansion. These threats operate in a synergistic manner to cause degradation of habitat and population decline in important species of high conservation concern such as lions and elephants. Recent studies conducted in Yankari Game Reserve, Nigeria have revealed that the top-down approach of Yankari by the State and NGOs is unsustainable. A survey of 18 communities was conducted in Nov 2015 - Feb 2016. A stratified random sampling of the 18 communities based on the 3 main districts in the Area was done. In each community, three males were selected by the community leader to speak on the past and present relationship the community has with the park staff, Government and NGOs. The top percentage complaints are: villagers have knowledge of livestock incursions in the reserve by foreign herders, yet they can't stop them; villagers are not involved in the protection of the park; villagers suffer crop raids from elephants are they are not compensated

and their youth are unemployment. The findings revealed that the communities have suffered neglect by the past Government as well as the past park administrators. Consequently, the communities have negative attitudes and distrust towards the Bauchi State Government and the current staff managing Yankari. Drawing from the findings of these studies, GyaraYankari (our new project) adopts a bottom-up, community-led model which is currently being implemented as a conservation strategy for the Reserve to develop a management plan. A novel participatory scenario planning workshop is being designed to get an understanding of how and to what extent the communities can be engaged in the management of Yankari. It is believed that this model could be replicated in other similar protected areas in West Africa.

MAINTENANCE OF MARINE BIODIVERSITY THROUGH OFFSETTING: INNOVATIVE FINANCING OR RISKY BUSINESS?

Holly Niner, UCL

Current funding for marine conservation initiatives is recognised as insufficient to match the global trend of declining marine biodiversity. Biodiversity offsetting, which seeks to balance biodiversity losses of development through an aim of no net loss, has been proposed as one approach through which additional revenue for marine conservation can be sourced. However, the approach has been developed primarily for terrestrial application and little academic attention has been paid to its use in marine environments. We present a review that shows global uptake of marine biodiversity offsetting, in various forms, on a worldwide scale. We found that the principles widely acknowledged as necessary to achieve an aim of no net loss and prevent misuse of the approach are not always being applied comprehensively. This could represent an inadvertent facilitation of biodiversity loss, however this flexibility in applying offsetting could also be an opportunity to accrue funds for wider marine conservation. Australia has offsetting policies at a federal and state level and is an ideal case study to explore the complexities and practicalities of applying biodiversity offsetting in a marine context. Perspectives of stakeholders including regulators, policy makers, academics, industry and NGOs were used to explore how marine biodiversity offsetting is being carried out across Australia. Views and experiences ranged widely among jurisdictions and the sectors that participants were located. Key issues related to the challenges of applying principles thought to be essential for an aim of no net loss in a marine context, equity of governance across sectors and concerns about cost displacement. Despite little consensus on whether the approach necessarily prevents biodiversity losses, offsetting was generally well-accepted and some participants presented interesting ideas on opportunities it could leverage for wider conservation gains.

MANAGEMENT OF PROTECTED AREAS IN COLOMBIA UNDER CLIMATE UNCERTAINTY

Claudia Munera, Australian National University, Fenner School of Environment and Society; Nigel Dudley, Equilibrium; Michael Dunlop, CSIRO Land & Water; Carolina Figueroa, Luc Hoffmann Institute; Oscar Guevara, WWF; Lorrae Van Kerkhoff, Australian National University, Fenner School of Environment and Society; Carina Wyborn, Luc Hoffmann Institute

The goal for protected areas to remain as an "ecological representation of unchanging heritage assets" may not be possible in the future under uncertain climate change. This challenge requires a new approach, where managers must confront the potential changes in ecosystems and its implications for management and planning. This needs new abilities that help to incorporate long term change and uncertainty into the planning tools, with implications in the decision-making process from local, regional and national level. Managers must be ready to understand, react and accept the changes in the ecosystems as climate changes. The Conservation Futures project is working in Colombia, looking to introduce innovative strategies to help protected area managers and related agencies to incorporate long term planning. Founded in the principles of design thinking and co-production, it builds on a multi stakeholder process of thinking, ideation and implementation to understand how values, rules and knowledge influence adaptation decisions through time in order to adapt to current and future changes. The project aims to develop and trial a 'Conservation Futures' methodology that may be used in other contexts and places to help mainstreaming anticipatory climate adaptation (climate smart) thinking in conservation policy, planning and management. We are working collaboratively with WWF Colombia and Parques Nacionales Colombia, to assist protected area managers to understand how to approach climate change as a planning and management challenge for the present day, and incorporate consideration of highly uncertain futures in current plans, decisions and actions. The overall objective of the project is to "improve the resilience of protected area systems by increasing our collective capacity to make decisions under uncertainty". Here we will present preliminary results of the implementation of the methodology in Colombia and discuss opportunities to transfer it into other countries.

MAP OF LIFE - DATA, MODELS AND TOOLS IN SUPPORT OF NATIONAL BIODIVERSITY MONITORING AND POLICY

Walter Jetz, Yale

Geographic information about biodiversity is vital for understanding the many services nature provides and their potential changes, yet remains unreliable and often insufficient. By integrating a wide range of knowledge about species distributions and their dynamics over time, Map of Life supports global biodiversity education, monitoring, research and decision-making. Built on a scalable web platform geared for large biodiversity and environmental data, Map of Life endeavors provides species range information globally and species lists for any area. With data and technology provided by NASA and Google Earth Engine, tools under development use remote sensing-based environmental layers to enable on-the-fly predictions of species distributions, range changes, and early warning signals for threatened species. The ultimate vision is a globally connected, collaborative knowledge and tool-base for regional and local biodiversity decision-making, education, monitoring, and projection. For currently available tools, more information and to follow progress, go to MOL.org.

MAPPING THE GLOBAL GOVERNANCE CONTEXT FOR LAND TENURE SECURITY

Allison Kelly, University of Washington; Margaret Holland, University of Maryland, Baltimore County, UMBC; Yuta Masuda, The Nature Conservancy

Land tenure security is widely regarded as a critical factor for effective and sustainable conservation (Larson et al., 2013) and for improving human well-being (food security, economic development etc.) (Payne, Durand-Lasserve, & Rakodi, 2009). It is also seen as a critical factor for major global policy strategies and agendas, such as the Sustainable Development Goals, Paris Agreement, or REDD+. Policymakers in particular often allocate resources first at the national-level, indicating the need for a global understanding of land tenure security. However, land tenure security consists of macro and local factors, with some researchers arguing that tenure security cannot be expressed at the global-scale. This may explain why there is a lack of research providing spatially explicit global data on land tenure security and its association with conservation and human well-being variables. In this paper, we create a global index of the Governance Context for Land Tenure Security (GC-LTS) using existing global datasets as a measure of the macro factors that contribute to land tenure security. The GC-LTS is important for research on coupled-human-natural systems because land tenure security is directly and indirectly related to human behavior and natural resource management. We find that the index is significantly correlated with human well-being indicators, consistent the long held finding in the literature that securing tenure can improve human well-being. In examining the spatial distribution of the GC-LTS within remaining intact forest areas, we find that large areas of intact forest are located in areas with weaker governance context for land tenure security. We also identify countries with a high number of endemic species and lower GC-LTS values. This analysis highlights areas that are priorities for further study of the potential for land tenure security interventions to improve both human well-being and conservation outcomes.

MEASURING CORAL REEF CONSERVATION EFFECTIVENESS TO PLAN IMPROVEMENTS

Nohora Galvis, Observatorio Pro Arrecifes Coral, Fundacion ICRI Colombia; Rosa Helena Galvis, Observatorio Pro Arrecifes Coralinos de Colombia

A critical multidisciplinary evaluation considers the performance of ecological, social and economic indicators to evaluate the effectiveness of conservation efforts. Global Perspective: A social psychological analysis of group thinking for the different scientific teams, stakeholders and managers perspectives about the restoration projects, unsustainable development, pollution and overfishing as well as the economic implications of considering few alternatives of local vs. global conservation. Coral reef scientists showed concerns about three recent subjects of discussion: 1) Regardless of any efforts from local management Coral Reefs are being impacted by coral bleaching related to climate change. 2) Monospecific coral restoration may be an easy and fast solution, good enough to allow unsustainable development. However, most of the projects presented results of high mortality at the beginning as normal and the supporters of those projects claim success by reaching 40% of survivorship at the final stages. 3) Prevention is better than to cure since the high costs of integral coral reef ecosystems restoration should be considered when there are other alternatives. These first two trends are dangerous if cause disengagement by local managers and enhancing investment in failure projects by top decision makers who are interested in destructive mega projects. The last one is a cautionary alert to avoid the potential impacts on natural coral reefs Favoring the development of artificial reefs with a different concept of ecosystem (Frankenstein`s reefs). Local Perspective: Two case studies prove relevance of the Citizen Science to involve communities to improve conservation effectiveness in non-protected coral reef areas in Colombia. Recommendations to the National

Parks System were formulated with baseline information for the inclusion as new marine protected areas. Recommendations to plan improvements and to avoid the useless success of paper marine protected areas.

MESOCARNIVORE DECLINE AND THEIR ROLE IN ECOSYSTEM FUNCTION

Jan Schipper, Arizona Center for Nature Conservation, Phoenix Zoo; Christine Breitenmoser, IUCN Cat Specialist Group; Nicole Duplaix, Oregon State University; José González-Maya, ProCAT Colombia, Sierra to Sea Costa Rica

Mesocarnivores represent a unique group of species which are highly susceptible to changes in wildlife community trophic dynamics. In other word, they have similar traits to larger carnivores in having a top down influence by preying on smaller species, but at the same time their numbers are often kept in check by top predators. As the "middle man", mesocarnivores are influenced by cycles of prey abundance, which can be based on seasonality and climate factors, hunting pressure, ecosystem contamination, and habitat modifications. However increasingly, when mesocarnivores are "released" from predation (so called "mesocarnivore release") their numbers can grow disproportionately to the prey available and have an influence of the entire wildlife community composition and trophic dynamics. Mesocarnivores occur globally across almost all terrestrial habitat types, and have diverse evolutionary lineages; including Felidae, Ailuridae, Eupleridae, Herpestidae, Mephitidae, Mustelidae, Nandiniidae, Prionodontidae, Procyonidae, and Viverridae. Although many mesocarnivores have large ranges and are generalists in terms of prey and habitat, a growing number are threatened with extinction. The IUCN Red List of Threatened species has systematically assessed all of these species over time, and the general trend is that small ranging species (especially confined to islands or habitat fragments) with specific prey needs (ie diet) tend to be the most threatened – due to constricted area but also susceptibility to trophic interactions with predators and prey. While some still remain poorly understood and require additional research, mesocarnivores are often overlooked in terms of benefits they play in stabilizing ecosystems. Here we evaluate the trophic interactions and how their role as mesocarnivores within complex and changing ecosystems dynamics is becoming a growing concern for many species long term survival.

MINIMISING THE CUMULATIVE IMPACTS OF URBAN EXPANSION SCENARIOS FOR 600 SPECIES

Brendan Wintle, University of Melbourne; Heini Kujala, University of Melbourne; Amy Whitehead, University of Melbourne

Biodiversity impact assessments under threatened species legislation often focus on individual development proposals at a single location, usually for a single species, leading to inadequate assessments of multiple impacts that accumulate over large spatial scales for multiple species. Regulations requiring ad-hoc assessments can lead to "death by a thousand cuts," where biodiversity is degraded by many small impacts that individually do not appear to threaten species' persistence. Spatial prioritization methods can improve the efficiency of decision-making by explicitly considering cumulative impacts of multiple proposed developments on multiple species over large spatial scales. We present an assessment approach and a unique case study in which spatial prioritization tools were used to support assessment of a large development plan in Western Australia. The application of the approach helped identify development options that resulted in reductions in biodiversity impacts and informed expansion of the protected area network. Using these tools to assess trade-offs between conservation and development will help identify planning footprints that minimize biodiversity losses.

MONITORING FOR SUCCESS IN SPECIES TRANSLOCATIONS

Robert Gitzen, Auburn University; Oded Berger-tal, Mitrani Department of Desert Ecology, Ben-Gurion University of the Negev; David Jachowski, Department of Forestry and Environmental Conservation, Clemson University

Appropriate monitoring will increase the probability of success of a translocation program. Although rarely self-reported as a difficulty by individual programs, broader reviews indicate that many programs have lacked well-defined quantitative reintroduction objectives. Without such objectives, a program has little basis for prioritizing what and how to monitor. In general, there may high interest in monitoring many aspects of a translocation in addition to demographic parameters, such as behavior, disease dynamics, physiological parameters, ecosystem responses, and critical human-dimensions aspects. In well-funded translocation efforts, careful planning may allow a diversity of integrated questions to be addressed, advancing reintroduction science. Unfortunately, most translocation programs need to focus sparse resources more narrowly on measuring progress towards top-priority conservation objectives and on providing essential information for ongoing decisions (e.g. whether to release more animals). A challenge faced in any translocation program is that monitoring needs to be adaptive and dynamic. For example, an appropriate monitoring approach during the initial post-release period typically will have to change as the population expands. In

animal translocations, it is common to equip released animals with radio-transmitters, but as transmitters fail and recruitment of new individuals occurs, observation uncertainty about population rates and trends often dramatically increases. The preferred time to develop and test novel monitoring techniques that will be useful as the population expands is before and during the initial translocation (e.g. using transmitted animals to develop new methods for monitoring a cryptic species). The careful planning needed to develop a useful monitoring program and to build monitoring into a broader objectives-focused framework guiding decisions about the reintroduction program should long before any translocations occur.

MONITORING WITHIN AN ADAPTIVE MANAGEMENT FRAMEWORK FOR INFORMING CONSERVATION ACTIONS IN COLOMBIA

Leonor Valenzuela, Wildlife Conservation Society; German Forero-Medina, Wildlife Conservation Society; Lina Caro, Student; Lina Caro, Student; Isaac Goldstein, Wildlife Conservation Society; Jhon Infante, Yoluka ONG; Sindy Martinez, Fundación Omacha; Carlos Saavedra, Wildlife Conservation Society

Following an adaptive resource management (ARM) framework, WCS designed and implemented monitoring programs for five projects that seek the conservation of landscape species in the Orinoquia, Colombia. The objective of these programs is to gain information about the system, inform management actions and assess the effectiveness of the strategies implemented. The monitoring approach to evaluate changes in the state variable as a response to changes in the threats can be divided in two groups: those that evaluate changes in population structure (or a particular life stage), and those that evaluate occupancy as a state variable. For the Moriche palm (*Mauritia flexuosa*) fire management was confirmed as a useful conservation strategy, because the average number of seedlings was significantly higher in areas without fire than in areas subject to such pressure (without fire =19.4, with fire = 3.7; F1,36=5 y P0.05,2=0.03); additionally, the proportion of reproductive adult tends to be higher in areas without fire (without fire = 0.8, with fire = 0.6, F1,36=0.4 y P0.05,2=0.1). Monitoring has also allowed the assessment of the effectiveness of surveillance activities for protection of nests and adults of the Giant South American River Turtle (*Podocnemis expansa*). During the first year, the proportion of harvested nests was significantly higher in unprotected beaches than in protected ones (Chi2 267.2, P<0.001) and in the second year, the proportion of harvested nests in protected beaches did not increase compared to the first year (Chi2 1.8, P=0.17). Finally, monitoring allowed a baseline knowledge of the populations of Tapir (*Tapirus terrestris*), which had an occupancy of 0.87 (CI95% 0.85-1). Occupancy of this species was related to area of forest, validating the conservation strategy of setting agreements with landowners for the conservation of the forest and establishing Private Reserves, which favor the presence of other species like *Tayassu pecari* and *Mitu tomentosum*.

MOVING FROM DATA TO ACTION: SHARING OWNERSHIP OF THE RESEARCH PROCESS WITH INDIGENOUS SCIENTISTS

Matthew Hallett, University of Florida

Over the last 30 years, conservation has moved towards a more participatory approach which seeks to engage communities as stakeholders in a process that seeks to simultaneously address conservation and development goals. More inclusive community-based approaches also emerged at a time when ecology was in the midst of important conceptual shifts to include humans in a systems view of the world and from expert-based towards more participatory approaches. With human activity driving habitat loss and species extinctions in places where they study, many scientists have felt compelled to engage communities and delve into conservation. We believe that opening up the research process to a high level of participation by project stakeholders holds the key to moving from data collection to conservation action. In developing partnerships, providing structured training, and allowing stakeholders to direct research programs, scientists can continue to build knowledge from structured, testable questions while providing a catalyst for addressing conservation issues. Providing opportunities for employment, capacity building, and leadership development also instills value in research and ownership over the results, thus increasing the probability that they will be applied. We will discuss our work with indigenous communities of the Rupununi Region of Guyana, highlighting ongoing projects, our process for developing them, and their management implications, including projecting the theoretical niche of feral Asian water buffalo and its applications for invasive species management; understanding the impact of increasing road traffic and speed on wildlife and applications for protected area management; developing and applying a method for identifying individual giant anteaters and applications for supporting of eco-tourism; and mapping the frequency and distribution of depredation of cattle and retaliatory killing of jaguars and applications for livestock management.

MUSEUMS LOOKING TO THE FUTURE: REMOVING BARRIERS TO GLOBAL COLLABORATION FOR CONSERVATION

Nora Bynum, Field Museum; Diana Alvira, Field Museum; Debra Moskovits, Field Museum; Nigel Pitman, Field Museum; Corine Vriesendorp, Field Museum

Natural history museums have a tradition of expertise describing, studying, and mapping Earth's diversity—both biological and cultural. The vast collections in museums—Earth's Library of Life—are the foundation for this specialization and expertise. But with ever-accelerating threats to landscapes and cultures around the globe, natural history museums are recognizing that their mission does not end at exploring and explaining, but extends into sustaining biological and cultural diversity. The papers in this symposium illustrate that while diversity science is fundamental for effective conservation action and cultural understanding, it alone is not sufficient. Information must be translated into implementable recommendations that lead to concrete results on the ground for integrity of the landscape, conservation of biological diversity, and quality of life for local people. In addition, the group of natural history museums participating in this symposium do not represent the full diversity of collections-based institutions (other museums, botanical gardens, aquaria and zoos) that can and do contribute to conservation. We look forward to helping convene a global community of collections-based institutions working on conservation, removing barriers to collaboration among these organizations. These barriers can be at least partially addressed by capitalizing on greatly increased access to digital and digitized collections, along with relatively low-cost forms of communication across large distances. Drawing on vast collections, outstanding scientific research, and innovative educational expertise, natural history museums can provide the science to cement conservation action, inform management plans, and build local capacity for programs in conservation and sustainable livelihoods, from remote forests to urban centers.

NATIONAL SCALE LAND-SEA PLANNING FOR PAPUA NEW GUINEA

Vanessa Adams, University of Queensland; Simon Linke, Griffith University; Hugh Possingham, The University of Queensland; Vivitskaia Tulloch, University of Queensland

There is a growing recognition that conservation strategies should be designed accounting for cross-realm connections, such as freshwater connections to land and sea. Yet, examples of integration across realms are relatively scarce, with most targeting priorities in a single realm, such as marine or freshwater, while minimizing threats originating in terrestrial ecosystems. To date no study has optimized priorities across multiple realms to produce a spatially explicit integrated conservation plan. This represents a major gap in the application of existing cross-realm planning theory. We present a national scale conservation plan for Papua New Guinea (PNG) that integrates multiple systems and cross-realm connectivity to account for cross-realm benefits and minimize threats. The relative importance of both the forests and inshore reef environments to PNG subsistence and commercial livelihoods emphasizes the importance of considering the connections between the land and sea. The plan was commissioned by the PNG Conservation and Environment Protection Authority (CEPA) and identifies a comprehensive set of priorities that meet conservation targets in both the land and sea. Furthermore, we present how a subset of areas were identified in collaboration with CEPA as priorities for immediate action and discuss mechanisms for implementation within these areas.

NAVIGATING UNCERTAINTY IN ENVIRONMENTAL COMPOSITE INDICATORS

Michael Burgass, Imperial College London; Benjamin Halpern, Nat. Center for Ecol. Analysis; E.J. Milner-Gulland, University of Oxford; Emily Nicholson, Deakin University;

Composite indicators (CIs) are increasingly used to measure and track environmental systems. However, they have faced criticism for not accounting for uncertainties and their often arbitrary nature. We highlight methodological challenges and uncertainties involved in creating CIs and provides advice on how to improve future CI development in practice. CIs make trends in complex environmental systems accessible to wider stakeholder groups, including policy makers. Without proper discussion and exposure of uncertainty, however, they risk misleading their users through false certainty or misleading interpretations. We offer guidance for future environmental CI construction and users of existing CIs, hence supporting their iterative development and effective use in policy-making.

NEED FOR CONSERVATION PLANNING IN POSTCONFLICT COLOMBIA

Pablo Negret, University of Queensland; Moreno Di Marco, The University of Queensland; Martine Maron, The University of Queensland; Hugh Possingham, The University of Queensland; James Watson, Wildlife Conservation Society

Colombia, one of the most biologically-rich countries on earth with an estimated 10% of global biodiversity within its borders, is emerging from 50 years of internal armed conflict. A final version of a peace agreement between

the oldest and strongest Colombian illegal armed group, FARC-EP, and the Colombian government was signed on November 12th, 2016. An important aspect of the peace agreement is rural land reform that aims to encourage displaced people to return to their homes and boost local economies in the less developed, rural regions. This land reform is likely to drive a rapid change in the development of agriculture and extractive industries in regions that were previously inaccessible because of the armed conflict, a phenomenon observed in many countries that have recently emerged from conflict. Without proactive planning, this rural return and its associated development could have catastrophic consequences for its biodiversity. Many of the conflict regions that were beyond the reach of the extractive industry and agricultural development harbor globally-significant levels of biodiversity. Across Colombia, there is a positive relationship between forest cover and the intensity of armed conflict and thousands of square kilometers of highly-biodiverse forested land once under FARC control are now becoming accessible for extractive industries and agricultural expansion. Given the nation's globally-significant natural heritage, conservation planning initiatives in a post-conflict Colombia is urgently needed. As a preliminary planning exercise, we developed a map of areas of high conservation value in Colombia and overlapped it with a map of conflict risk. Additionally, we generated an alternative map of conflict risk removing the risk generated by the FARC-EP. Conservation priority areas are suggested based on the analysis of these three maps and recommendations for conservation actions based on the findings are given.

NOTES FROM THE CAMPAIGN TRAIL: SCIENCE LEADERSHIP IN AN ADVOCACY ORGANIZATION

Kathryn Matthews, Oceana

"Science leadership" exists in many settings, and those leaders tend to excel in a number of areas: horizon scanning, executive administration, and as researchers in their own right. Those in the policy arena have the added challenge of mapping another landscape – that of their government's legislative and regulatory bodies. Another layer still is understanding gradients of political will and the levers that move decisionmakers – a space generally occupied by campaign-based environmental advocacy organizations. By which path(s) does a scientist arrive at such a place? What functions do they perform? What role do campaign-driven NGOs play in identifying, conducting and amplifying actionable science? What leadership skills are necessary for success, and how does one acquire them? What does negotiation and compromise look like for scientists when the organization's mission is not to conduct, or even communicate, research – as it is with most institutions at which we train – but to achieve specific legislative, regulatory or implementation goals? I will offer my perspective on those questions, shaped by my own experiences in academia, government, and the non-profit world where I currently live as the deputy chief scientist for an international marine conservation advocacy organization.

NOVEL APPROACHES TO UNDERSTAND AND INFLUENCE INCENTIVES FOR ILLEGAL RESOURCE USE IN PROTECTED AREAS

Henry Travers, University of Oxford; Lucy Archer, Imperial College London; Julia Baker, Balfour Beatty; E.J. Milner-Gulland, University of Oxford; Geoffrey Mwedde, Wildlife Conservation Society; Andrew Plumptre, Wildlife Conservation Society; Dilys Roe, IIED; Aggrey Rwetsiba, Uganda Wildlife Authority

Despite increasing use of scientific evidence to guide conservation decision-making, the design of conservation interventions still often falls back on implementers' personal experience and subjective judgement. This is particularly true for interventions aiming to tackle the recent global surge in poaching and illegal wildlife trade, where pervasive narratives often obscure complex realities. Under this scenario, there is a danger that opportunities for more effective solutions may be missed and that the long-term costs to conservation may be higher. Yet there are now a growing number of techniques that enable the social, economic and cultural factors that drive wildlife crime to be better understood. Similarly, the increasing adoption of predictive methods in conservation allows us to test the interventions that might be implemented to combat these drivers prior to their implementation. Drawing on a case study from Murchison Falls and Queen Elizabeth National Parks, Uganda's two largest protected areas, we will show how such techniques can be combined to enable conservation decision-makers and practitioners to move beyond 'best practice' and develop evidence-based strategies that actively address the main drivers of wildlife crime in protected areas.

OCCUPATION MODELS AND SUSTAINABLE HUNTING AT THE TAMSHIYACH-TAHUAYO CONSERVATION AREA, PERU

Emiliana Isasi-catala, Laboratorio De Conservación y Manejo De Fauna; Isaac Goldstein, Wildlife Conservation Society; Cecilia Arellano, Wildlife Conservation Society; Claudio Bardales, Wildlife Conservation Society; Frank Flores, Wildlife Conservation Society; Leonardo Maffei, Wildlife Conservation Society; Lucas Muñoz, Wildlife Conservation Society; Marco Odicio, Wildlife Conservation

Society; Leon Torres, Wildlife Conservation Society; Lindher Villacorta, Wildlife Conservation Society

The objective of this work was to assess the use of occupancy models as tools to monitor the effectiveness of the sustainable use of some species by surrounding communities. Between September and November of 2016, in "Comunal Tamshiyacu Tahuayo" Regional Conservation Area (ACRCTT), 85 grids of 1km2 and 85 grids of 0.04km2, were established to evaluate the occupancy of large (ungulates) and small hunting species (mainly rodents) respectively, through signals and trails in transects and camera traps stations. Single season-single species occupancy models with nine site covariates (CovS) were adjusted to assess the hunting effect for each species. The occupancy estimated for ungulates was high (Ψ> 0.80), except T. pecari, which does not exceed 0.60. For most of these species, occupation is higher in the sampling units furthest from the populated centers and navigable rivers, with ACRCTT being a major area for the maintenance of populations (SigΨCovS) < 0.05). This indicates that hunting pressure affect the large species evaluated in the ACRCTT, but does not generate a significant impact on their populations. The occupancy estimated for rodents was also high (Ψ> 0.60), and is higher in the sampling units furthest from the populated centers (SigΨCovS) < 0.05). This spatial pattern is important for the conservation of species like Cuniculus paca, with drastic reductions in occupation (0.15) being estimated near some populated centers, which facilitates the identification of priority management areas for ACRCTT. The accuracy of these estimates allows the use of occupancy as an indicator for the development of a monitoring program for the sustainability hunting at the ACRCTT.

ONE THIRD OF THE GLOBAL PROTECTED AREA ESTATE UNDER INTENSE HUMAN PRESSURE

Kendall Jones, University of Queensland

Protected areas (PAs) are the main tool for halting biodiversity loss since they can be effective at halting habitat loss and fragmentation and allowing for proactive conservation actions within their boundaries. In an era where biodiversity loss and conservation failures dominate environment headlines, the one major success story has been the extraordinary expansion of the terrestrial protected area estate, driven by the Convention of Biological Diversity. Since the treaty was ratified in 1992, the PA estate has grown by 9% of global land area, and ~15% of the Earth's land is now gazetted for conservation. Many (46%) nations claim to have reached their CBD commitments (17% PA coverage) based on recent PA designations, yet no nations report on the condition of land within the PA estate. Here, using a globally consistent, fine scale and up to date human pressure map, we provide the first comprehensive global assessment of human pressures within PAs, discovering that 32.8% of land within PAs is converted to human dominated land uses, while only 42% of protected land is free of measurable human pressure. At the national level, 73% of countries have more than half of their PA estate converted to human dominated land uses. When only considering land within PAs that does not have intense human activity, the number of ecoregions (ecologically similar areas) that achieve the CBD target of 17% PA coverage drops by one fifth. These findings suggest that solely reporting on the areal extent of the PA estate grossly overestimates the true level of global protection for biodiversity. It is therefore crucial that international reporting on protected area targets includes measures of human pressure and ecological condition. Furthermore, reduction of human pressure within existing PAs must become an international priority, and strategic expansion of protected areas to meet CBD commitments must be concentrated in ecologically intact areas that are at high risk of future conversion.

OPPORTUNITIES AND CHALLENGES FOR SUSTAINABILITY IN SMALL-SCALE FISHERIES EMBEDDED IN PROTECTED AREAS

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Many Latin American (LA) small-scale fisheries (SSFs) operate within ecologically sensitive areas, where reconciling conservation with resource use is socially and politically challenging due to the large number of people involved that depend on fishing for their livelihoods. Diverse institutional arrangements have been independently designed and implemented in several LA countries to accommodate SSFs (among other uses) within various forms of multiple-use marine protected areas (MPAs). Examples include the Brazilian "Reservas

Extrativistas Marinhas", the Biosphere Reserves (e.g. Mexico), the Mangrove Exploitation Areas of Ecuador, the Integrated Regional Management Districts of Colombia, and the Marine Parks and Natural Protected Areas of Chile and Argentina. In these MPAs, the need to attend to conservation has created both opportunities and challenges for SSFs management. MPAs may affect fisheries in a number of positive and negative ways, including how rules of access and resource use are defined, the decision-making arrangements, the level of resource and environmental stewardship attained, the effort devoted to and the effectiveness of monitoring and enforcement, among others. We hypothesize that the sign -positive or negative- of these effects is associated with the origin of the MPAs (e.g. top down, bottom up, mixed). We analyze a collection of case studies of SSFs from LA, all of which operate inside MPAs that differ in origin, design, and implementation. We aim to provide insights on the following questions: 1. How do the diverse formats of MPAs affect relevant aspects of SSF governance?; 2. Are those effects associated with the origin of MPAs?; and 3. Which factors (besides origin) have positively or negatively affected the sustainability of SSFs embedded in MPAs? This analysis highlights the diversity of local conditions that need to be considered in the quest for solutions that accommodate diverse goals in complex social-ecological systems.

OPPORTUNITIES AND RISKS FOR CONSERVATION IN THE MILLENNIAL GENERATION

Yuta Masuda, The Nature Conservancy; Sheila Reddy, The Nature Conservancy

The Millennial generation will shape the future sustainability of our world through its sheer size and putative new preferences (e.g., the sharing economy, urban living, and marrying later). But there is little systematic research on Millennial's attitudes and behaviors towards conservation and the implications for conservation programs. We help fill this gap by assessing the potential for attitudes and behaviors of Millennials in the US, China, India, and Brazil to change future household consumption patterns and mitigate their associated environmental footprint. An analysis of the land footprint of six categories of current household consumption shows that food has the most intense land footprint (m2/USD) in all countries, land footprint intensity is highest in China and Brazil, and growth in consumption in China will result in large increases in the land footprints related to mobility, clothing, services, and manufactured goods. Evidence of differences in Millennials' and non-Millennials' conservation attitudes and "change agent" behaviors (e.g., policy support, demonstrating) suggests that there is some potential for Millennials' consumption patterns to be different based on these factors alone. Chinese and Brazilian Millennials show the greatest increase in pro-conservation attitudes and concerns (e.g., air quality in China), while Indian Millennials show the greatest increase in "change agent" behaviors. A potentially concerning trend is that US Millennials are less likely to see the environment as having a direct effect on their life and are less concerned about water pollution. These results suggest there is a potential for Millennials' behaviors to directly and indirectly decrease their environmental impact, but strategies for engaging Millennials should be tailored to the different country contexts.

OPTIMIZING INVASIVE LIONFISH CONTROL TO PROTECT CARIBBEAN REEF FISH COMMUNITIES

Stephanie Green, Center for Ocean Solutions

Many invasions occur at a scale beyond the management resources available to eradicate them, setting up a long-term battle for control. For these invasions, two key questions arise: What level of control is sufficient to mitigate ecological impacts in high-priority management areas? What resources are required to achieve control? The ongoing invasion of predatory lionfish in the Western Atlantic urgently requires answers to these questions. We develop a general quantitative model for identifying the conservation benefit of control activities for invasive lionfish, in terms of achieving ecological protection of the invaded community. Specifically, we link a predictive ecological model identifying threshold densities at which lionfish overconsume native fish with an economic model of the cost of removal required to suppress lionfish densities below threshold levels. We parameterize the model with data from a studies of lionfish removal effort in South Florida, the US Virgin Islands, Bahamas, and Belize in which we tracked the effort and success rate of culling by volunteer and natural resource management staff removing lionfish from half of the sites bi-monthly on scuba, and the response of native fish communities at the removal and reference non-removal sites. We find that the level of local population suppression required (in terms of density reduction and removal frequency) to achieve maximum ecological benefit (maintenance of native fish biomass) is highly variable across the system, with some sites requiring far less effort than is allocated under current management regimes, and some far more. Lionfish densities and the rate of recolonization between visits was related to habitat structure and local oceanographic conditions. Our work provides a predictive method for efficiently prioritizing and allocating resources control to

achieve ecologically-based goals for conservation success across invaded areas.

ORGANISATION OF THE NEW KBA PROGRAMME AND PARTNERSHIP

Thomas Brooks, IUCN; Melanie Heath, BirdLife International; Jane Smart, IUCN; Simon Stuart, Synchronicity Earth; Zoltan Waliczky, BirdLife International

Eleven organisations (ASA, BirdLife, CEPF, CI, GEF, GWC, IUCN, NatureServe, RSPB, WCS, WWF) have signed a KBA Partnership Agreement, with each investing >$1m over 5 years in supporting KBA identification, delineation, and monitoring. We summarise the 6 main mechanisms through which it will implement a KBA Programme, and propose metrics by which the success of each might be measured. 1) The KBA Community, organised by 4 regions, will connect and empower the many institutions and individuals involved in application of the new KBA Standard to identify and delineate KBAs within countries, and monitor them. 2) The KBA Database and Website, managed by BirdLife on behalf of the KBA Partnership, will document and disseminate data on sites so identified and delineated following the KBA Standard (15,524 documented to date). 3) The KBA Committee will serve as the decision-making body for the KBA Partnership, representing the KBA Partners and the KBA Community. 4) The KBA Secretariat, accountable to the Chair of the KBA Committee, will lead implementation of the KBA Programme. 5) The KBA Consultative Forum will provide a mechanism by which end-users of KBA data can receive information from and feedback questions to the KBA Committee, which is required to respond accordingly. 6) Finally, the KBA Standards & Appeals Committee, appointed by the IUCN SSC and WCPA Chairs (themselves elected by the IUCN Membership of governments and NGOs), serves to maintain the KBA Guidelines and provide independent adjudication in the case of petition against KBA identification or delineation. Each of these mechanisms is new, and so it is not yet possible to evaluate them, but establishment of indicators of their effectiveness (through development of a KBA Strategic Plan) will clearly be essential in maximising the degree to which KBAs continue to "contribute significantly to the global persistence of biodiversity".

OVERCOMING BARRIERS FOR LARGE-SCALE REVEGETATION IN A DEGRADED AGROECOSYSTEM OF SOUTH ECUADOR

Antonio Crespo, Universidad del Azuay; Karla Pintado, Universidad del Azuay

Knowledge of the processes that determine the structure and function of neotropical ecosystems is still scarce. In degraded ecosystems, understanding the biotic and abiotic stressors that impede plant recruitment is paramount for assisting vegetation recovery. This study summarizes the results of manipulative experiments carried out in a degraded agroecosystem of south Ecuador (2300-2700 m a.sl.) between 2012 and 2016. We discuss the influence of different ecological factors associated to plant establishment, by evaluating the responses of native tree species (*Erythrina edulis*; *Prunus serotina*; *Caesalpinia spinosa*; *Oreocallis grandiflora* and *Inga insignis*) to direct seeding. The first experiment tested the effects of herbivory and weeding on all species except *I. insignis*, while a second experiment tested the effects of mulching on *E. edulis*, I. insignis and *P. serotina*. For both experiments we analyzed seedling emergence, survival and growth at 12 and 24 weeks after sowing, respectively. Emergence and survival rates were evaluated using Kaplan-Meier survival analysis and growth was analyzed with ANOVA tests. Emergence and survival rates were negatively affected by herbivory ($p<0.05$), while weeding ($p=1.00$) and mulching ($p>0.05$) had null effects. Growth was negatively influenced by herbivory ($p<0.05$) and positively affected by mulching ($p<0.05$); weeding had a null effect ($p=1.00$). Revegetation efforts in this ecosystem should include protective structures against herbivores and soil cover. We highly recommend *P. serotina* and I. insignis for large-scale revegetation. *O. grandiflora* is sensitive to water and heat stress and a careful selection of microsites is required for planting. *C. spinosa* might have the same sensitivity but we lack evidence to support this affirmation. *E. edulis* had the highest growth rate of all species but is sensitive to desiccation and thus we recommend the use hydrogels or irrigation.

PARASITES AND PATHOGENS IN REINTRODUCTIONS AND TRANSLOCATIONS

Hamish McCallum, Griffith University; Stephanie Godfrey, University of Otago; Sarah Keatley, Murdoch University; Alan Lymbery, Murdoch University; Erin Muths, USGS; Amy Northover, Murdoch University; Andrew Thompson, Murdoch University; Adrian Wayne, Department of Parks and Wildlife, Western Australia

Reintroductions and translocations can fail because of parasites and pathogens present in the recipient ecological community. This is clearly an issue when reintroduction is being considered because of extirpation caused by infectious disease, but the problem is not restricted to this situation. Parasites and pathogens present in the translocated animals may also deleteriously affect the animals' post-translocation or have wider impacts on the

recipient ecological community. We present a decision tree to guide managers considering reintroduction following disease -induced declines, illustrated with case studies including Tasmanian devil facial tumor disease and amphibian chytrid fungus. There are relatively few experimental investigations of parasite communities following translocations. Woylies (*Bettongia penicillata*) are an endangered marsupial herbivore and translocations have been extensively used as part of their recovery plan in Western Australia. We monitored parasite communities in Woylies before, during and after the translocation and discovered changes in the parasite community post-translocation, possibly as a result of changes in host density. However, experimental treatment of half the translocated animals with a standard dose of ivermectin had little impact on the parasite community. The prevalence of Strongyloides-like nematodes was temporarily reduced, but treatment did not affect the prevalence or abundance of strongyle nematodes or the prevalence of coccidian protozoans.

PAYMENTS FOR ECOSYSTEM SERVICES: RIFE WITH PROBLEMS AND POTENTIAL—FOR SUSTAINABILITY

Alejandra Echeverri, Institute for Resources, Environment, and Sustainability - UBC; Kai Chan, University of British Columbia

Payments for ecosystem services (PES) programs are one prominent strategy to address economic externalities of resource extraction and commodity production, improving both social and ecological outcomes. But how much of that lofty goal does PES realize? Along with considerable enthusiasm, PES has faced a wide range of substantial critiques. In this talk, we characterize seven major classes of concerns associated with common PES designs, and use these as inspiration to propose promising opportunities for significant improvements in PES outcomes and uptake. The problems include (1) new externalities, (2) misplacement of rights and responsibilities, (3) crowding out existing motivations, (4) efficiency-equity tradeoffs, (5) monitoring costs, (6) limited applicability, and (7) top-down prescription/alienating agency. As currently practiced, many PES programs are thus of limited benefit and even potentially detrimental to sustainability. From this dire conclusion, we highlight some innovations that might be combined and extended in a novel approach to PES that may address all seven problems. Problems remain, and new ones may arise, but the proposed approach may offer a way to rescue PES as a major tool for enabling sustainable relationships with nature, conserving and restoring ecosystems and their benefits for people now and in the future.

PENTECOSTALS AS CONSERVATION ALLIES IN THE TROPICAL ANDES OF PERU

Oscar Gonzalez, Grupo Aves del Peru

In the montane forest of the Andes and in the Amazon, a religious revolution is occurring. Protestant churches are growing exponentially, and the most common are those within the Pentecostal Movement. There are valuable conservation areas where Pentecostals are strongly influential, so interacting positively with them is vital to the success of research and practice projects. This presentation focuses on the conservation implications of a bird ecology project between 2010 and 2014 in the montane forest of Carpish, located in the central part of the Peruvian Amazon. This area is considered an IBA (Important Bird Area) by Birdlife International, and has recently been declared a protected area by the local government. Residents are mainly Quechua peasants who are involved in the Pentecostal Movement. Before addressing conservation issues with them, the researcher spent time becoming acquainted with the people, learning about their religious and cultural values, and observing their lifestyles. The realization that the Bible was considered authoritative in the lives of the people prompted the researcher to begin with nature-related passages when discussing his project with them. A researcher who self-identified as an Evangelical Christian introduced the principle of Creation Care that was well received. Leaders of the Pentecostal churches became highly interested in promoting conservation in their communities and participating in conservation initiatives.

PEOPLE, MANAGEMENT, AND BIODIVERSITY IN CITIES

Charles Nilon, University of Missouri

Urban areas have changed the science and practice of conservation. As coupled natural and human systems, cities bring together new assemblages of habitats and species, a human population that is socially, culturally, and economically diverse. In this presentation I will review research documenting three ways in which conservation science and practice is changing: 1. Recent studies of global studies of plants and birds in cities suggest that cities have a higher conservation value than is suggested by studies reporting biotic homogenization; 2. Conservation practice in cities builds on a 40 year tradition of planning, management and design and recent innovations linked to international conservation efforts; 3. Urban residents address conservation in multiple ways and at multiple scales and efforts to address inequality and social justice are changing the practice of conservation.

PLANT DIVERSITY, BIOGEOGRAPHY AND CONSERVATION OF NEOTROPICAL SEASONALLY DRY FORESTS

Toby Pennington, Royal Botanic Garden Edinburgh; Matt Lavin, Montana State University

Neotropical seasonally dry forests are scattered in separate areas from Mexico to Argentina, including through the islands of the Caribbean. This fragmented distribution across numerous countries has impeded the study of their flora at a continental scale. A recent, continental scale dataset accumulated by the DRYFLOR network has confirmed previous indications that levels of plant species endemism in the individual areas of neotropical dry forests are often high, indicative of levels of floristic turnover that may exceed that found in neotropical savannas and rain forests. This high floristic turnover demonstrates the need for numerous protected areas throughout the Neotropics to protect this highly threatened vegetation. Molecular biogeographic studies of dry forest plants often show patterns of old species ages and geographic phylogenetic structure of related species found in small, confined areas, which underline the distinctiveness of the dry forest biome as an evolutionary theatre separate from other lowland neotropical biomes. These evolutionary patterns may be less marked when rainfall increases in semi-deciduous formations, which we suggest have been more recently assembled through evolutionary time in diverse neotropical locations. In drier areas, plant species lineages are often remarkably old, dating to the Miocene, suggesting that their habitat – for example in dry Andean valleys - should be regarded as an evolutionary museum. Because many of these drier areas are entirely unprotected, these evolutionary museums may soon disappear.

POKÉMON GO: BENEFITS, COSTS, AND LESSONS FOR THE CONSERVATION MOVEMENT

Leejiah Dorward, Department of Zoology, University of Oxford; John C. Mittermeier, School of Geography and the Environment, University of Oxford; Chris Sandbrook, UNEP World Conservation Monitor - Department of Geography, University of Cambridge; Fiona Spooner, Centre for Biodiversity and Environment Research, UCL - Institute of Zoology, ZSL

Pokémon Go, an augmented reality (AR) smartphone game, is one of the most successful smartphone apps of all time. The game replicates many aspects of real-world wildlife watching and natural history as players are asked to join a fictional citizen science program to find, capture, and collect Pokémon, which are effectively virtual animals. Pokémon Go's success poses a number of unique opportunities and challenges for the conservation movement. Encouraging players to explore outside and consider various aspects of virtual species' biology, the game could increase awareness, engagement and interest in real-world nature. Alternatively, interacting with Pokémon could encourage exploitation of wildlife or replace players' desire to interact with real-world nature. Pokémon Go also highlights how adaptations to existing games could improve their conservation impact or how new conservation-orientated AR games could be created. The unprecedented popularity of Pokémon Go shows the potential impact of well-implemented AR games and how important it is for the conservation movement to proactively engage with this emerging technology.

POLICY SOLUTIONS FOR A SUSTAINABLE USE OF WILD MEAT IN THE CONGO BASIN: A PROPOSED ROADMAP

Robert Nasi, Cifor

In the Congo Basin, increasing population and trade from rural to urban areas compounded with the lack of any sizable domestic meat sector are the main drivers of unsustainable levels of hunting. Even where urban consumers have access to domesticated sources of meat they are imported and/or expensive and wild meat remains an important part of their diet. With an estimated yearly extraction rate in the Congo Basin of 4.5 million tons (Nasi et al. 2011), if wild meat consumption in the Congo Basin was to be replaced by locally produced beef, an area as large as 25 million hectares would have to be converted to pastures. Focusing on pig or chicken with their much higher feed conversion rates makes more sense because but producing additional 4.5 million tons of pig of chicken is unlikely to happen soon in the Congo Basin and will be laced with its own environmental issues. Achieving sustainable harvest of wild meat is therefore a necessity and by far, the best short to medium term option compatible with conservation, livelihoods, food security and nutrition. Multidisciplinary approaches are needed to combine a better knowledge of the use and trade of wild meat, the strengthening of legal frameworks, the provision of food and livelihood alternatives and the sustainable use of wildlife. None of these alone appear to be able to solve the so-called "bushmeat crisis", but combined and incorporated into solid national and regional wild meat strategies, there is potential to achieve a more sustainable use of wildlife for food in the Congo Basin. Based on our and others research, we will present a comprehensive set of policy recommendations constituting a roadmap for a better governance towards a more sustainable wild meat sector working with the upstream actors to improve the sustainability of supply, reducing the demand and creating

an enabling environment for a controlled, sustainable wild meat sector.

POLLINATION AND SEED DISPERSAL INTERACTIONS IN ABANDONED PLANTATIONS

Francisco Fonturbel, Pontificia Universidad Catolica De Valparaiso; Jorge Cortés, Universidad de Chile; Daniela Salazar, Universidad de Chile; Caren Vega-Retter, Universidad de Chile

Pollination and seed dispersal interactions are critical processes for plant reproduction and natural regeneration. However, these mutualistic interactions can be hampered by disturbances of anthropogenic origin. In an anthropized world, abandoned productive lands (such as forestry plantations) are becoming more common and opening new opportunities for conservation. While there is an increasing body of evidence about the persistence of native species in exotic plantations, little is known about ecological interactions. We compared the performance of pollination and seed dispersal interactions in a keystone mistletoe (*Tristerix corymbosus*) between native forest and abandoned plantation stands. We found mistletoes to be more abundant and densely aggregated at the plantation, being visited more frequently than those of the native forest. The increased visitation rates at the plantation may result from the presence of shade-intolerant plants that present a copious offer of flower and fruit resources. Notwithstanding, the mistletoes thriving at the abandoned plantation have lower allelic richness and higher inbreeding coefficients than those of the native forest as result of a reduced gene flow. Such reduction in gene flow at the landscape level may result from a denser plant aggregation and behavioral responses of the pollinator and seed disperser vectors. Despite abandoned forest plantations may constitute a valid alternative for conserving native species and their ecological interactions, its long-term viability needs to be studied in detail, as molecular evidence suggests that thriving in this kind of habitat has elevated costs in terms of genetic diversity.

PREDICTIVE PROXY INDICATORS TO ASSESS THE LONG-TERM IMPACTS OF FOREST CONSERVATION FUNDING

Daniel Miller, University of Illinois; Pushpendra Rana, University of Illinois

Civil society groups, governments, and donors are increasingly demanding better evidence on the effectiveness of conservation policies and programs. Efforts to ensure such accountability in forest ecosystems confront the challenge that the results may take years, even decades, to materialize while conservation interventions usually last only a short period. Here we develop a new approach to address this challenge: the use of predictive proxy indicators (PPIs). PPIs are measures taken during implementation of a project, program, or policy that are designed to provide credible information on longer-term impacts. We identified PPIs relating to biodiversity conservation objectives based on review of the forestry portfolio of the World Bank, the largest donor in the forestry sector, covering the years 1990-2013. We then used a theory-based approach to validate the PPIs based on input from more than 100 experts from different development agencies, governments, and academic institutions. We found that standalone PPIs are difficult to identify, but that multiple indicators, considered together, can have strong predictive potential. We compare our results, which suggest that PPIs have potential to be a cost-effective monitoring tool in externally funded biodiversity projects, to indicators of success identified in locally-managed forest commons to draw out broader lessons for understanding long-term impacts of forest conservation efforts.

PREVENTING HUMAN-ELEPHANT CONFLICT IN FOREST AREAS OF TAMIL NADU, INDIA: THE ROLE OF ELECTRIC FENCES

Mangai Natarajan, John Jay College of Criminal Justice, The City University of New York

Tamil Nadu, India has a large population of 4000 wild elephants, clustered in several locations near villages. Given these large numbers, it is not surprising that conflicts between elephants and villagers are frequently reported in the media. Elephants engage in crop raiding and sometimes kill the villagers defending their crops. On occasion, villagers might kill elephants in retaliation or to prevent further incidents, though the animals are protected under state, national and international laws. Villagers use a variety of measures to protect their crops and NGOs have also experimented with different deterrent measures (e.g. electric fences, trenches, barbed wire, scaring tactics, noxious plants). Not enough is known about the effectiveness of such measures or their viability, but there appears to be a consensus that electric fences are the most effective deterrent to crop-raiding though they are costly to install and costly to maintain. Using a mix of focus group interviews and personal interviews, this project explores the attitudes to electric fences of villagers and forestry officials who are responsible for the elephants. It focuses especially on the impediments to the installation and use of electric fences (including the behaviors of elephants), and how these difficulties might be overcome. After all, it is the villagers' incomes and lives that are disrupted by these conflicts. Any measures

to deter the elephants, but which at the same time help to conserve these magnificent animals, can only be successfully implemented if villagers are involved.

PRIORITY AREAS FOR LANDSCAPE PROTECTION AND RESTORATION IN THE FACE OF CLIMATE CHANGE

April Reside, University of Queensland; Diana Fisher, University of Queensland; Sean Maxwell, The University of Queensland; James Trezise, Australian Conservation Foundation; James Watson, Wildlife Conservation Society

Connecting up human-dominated landscapes to retain biodiversity is a pressing conservation challenge. The confluence of environmental, social and economic values across landscapes make it very difficult to implement protected areas large enough to ensure species persistence. Compounding this challenge is the threat of rapid climate change, which is increasingly impacting environmental, social and economic values. Bigger-picture planning is urgently required in order to future-proof regions to provide benefits across sectors. Actions that can deliver co-benefits for both humans and the environment include land sharing, restoration, and private land conservation. For example, opportunities exist for carbon offset funding to provide both biodiversity conservation and economic opportunities for landholders. We use scenario planning to develop connectivity conservation solutions for the Great Dividing Range, which contains some of the most biodiverse landscapes in Australia. It is also home to 3/4 of Australia's human population and produces 30% of the nation's food. The Range extends the full length of the Australian continent, traversing variable climatic zones, elevation gradients and substrate types, providing refuge to species threatened by climate and land-use change. We generated maps of anthropogenic threats, carbon stock and sequestration potential and biodiversity priorities (based on 1,085 vertebrate species) under two climate change scenarios. With the assistance of key stakeholder groups, we co-developed maps for a suite of alternative conservation actions that match local social and economic conditions. By accounting for local social and economic values, we believe these proposed conservation actions have a greater chance of being successfully implemented, and are likely to deliver substantial co-benefits. Using this socially inclusive approach that sees all sectors contributing to a strategic conservation effort can benefit both people and nature.

PROGRESSING PERFORMANCE MEASURES TO ECOSYSTEM QUESTIONS

Beth Fulton, Csiro

Using indicators as a guide to management performance and system state is now an accepted part of resource management. However, progressing this to ecosystem properties and management has been a slow process. This paper discusses what has been achieved to date, what can be learnt from other complex management domains and what hurdles remain to operationalising indicators for ecosystem based management.

PUBLIC PARTICIPATION IN CONSERVATION MATTERS: A GLOBAL EVALUATION

Volker Mauerhofer, University of Vienna

Public participation in environmental matters covers also regarding conservation the right to information, to participation in administrative procedures and to justice. It particular defines whether nature and conservationists as its representatives have standing in a wide range of formal procedures where decisions are taken in connection with interests conflicting with conservation. This paper aims to provide a global and comparative overview of procedural rights of public participation in these matters within the so-called Aarhus convention of the United Nations Economic Commission for Europe and presents the results of a recently published study. The method applied was an in-depth literature review in particular of research papers, legal documents, policy papers, which was implemented by means of electronic databases (Web of Science, Scopus) as well as by internet research using terms such as public participation, access to information, participation in decision-making and access to justice in combination with continent names. The results were then analysed according to the five continents Europe, Africa, America, Asia as well as Oceania, and distinguished as well as discussed regarding general aspects, access to information, access to decision-making and access to justice. The results for the five continents show that: (1) there exist regionally and nationally large differences within the three pillars access to information, participation in decision-making and access to justice. (2) that access to information is widely legally established within all regions on all continents, and (3) that access to justice is the one sector of the three mentioned in Principle X of the Rio Declaration which has obtained the least reflection in legislation and implementation so far. This innovative study provides as far as visible the first time such a transcontinental and comprehensive overview on procedural rights related also to conservation and Public Participation.

REAL-WORLD SPATIAL AND CONCEPTUAL CONSERVATION PLANNING IN LARGE COMPLEX SYSTEMS

Armando Valdes-Velasquez, Foundations of Success/ Cayetano Heredia University; Nick Salafsky, Foundations of Success;

Traditionally, there were two main types of conservation planning. Spatial conservation planning focused on the question of "where" we should take action to conserve species and ecosystems, whereas site conservation planning focused on the question of "how" we should act at these sites once they were selected. In recent years, however, as we have expanded the scale and the scope of our conservation work, these two questions have become much more entangled with one another. Furthermore, when working in these larger and more complex systems, planning efforts have themselves become increasingly complicated and unwieldy, involving growing numbers of stakeholders and multiple conflicting means and ends. In this paper, we draw upon experience with large-scale planning efforts from the United States, Tanzania, East Asia and Peru to illustrate key principles for meeting these challenges. These principles include: 1) conducting planning in the context of an iterative adaptive management process, 2) integrating conceptual and spatial planning tools to provide common mental models, 3) making use of common standards to reduce duplication of effort, 4) finding the right balance between using professional planners to expedite the process, while still obtaining needed stakeholder input, and 5) embracing the concept of "messy" plans that can serve as living documents that guide both ongoing conservation work and learning.

RECENT CATASTROPHIC DECLINES IN WILDERNESS AND WHAT THIS MEANS FOR HALF EARTH

James Watson, Wildlife Conservation Society

Humans have altered terrestrial ecosystems for millennia, yet wilderness areas still remain as vital refugia where natural ecological and evolutionary processes operate with minimal human disturbance. Despite the myriad values of wilderness areas—as critical strongholds for endangered biodiversity, for carbon storage and sequestration, for buffering and regulating local climates, and for supporting many of the world's most politically and economically marginalized communities—they are almost entirely ignored in multilateral environmental agreements. This is because they are assumed to be relatively free from threatening processes, and therefore are not a priority for conservation efforts. Here I challenge this assertion using new comparable maps of global wilderness and demonstrate alarming losses comprising a tenth (3.3 million km2) of global wilderness areas over the last two decades. These findings underscore an immediate need for international policies to recognize the vital values of wilderness and the unprecedented threats they face, and to underscore urgent large-scale, multifaceted actions needed to maintain them. I place these findings in a Half-Earth paradigm, which I believe is essential starting place for ensuring we halt the biodiversity crisis that is well underway.

RECONCILING CONSERVATION NARRATIVES: EXPERIENCE OF COCOMASUR COLOMBIA WITH REDD+

Everildys Cordoba Borja, COCOMASUR

In 2010, the leaders of the community of COCOMASUR, an Afro-Colombian community near the Panama border, with a communal title to 13,465 hectares of tropical forest land, were offered the opportunity to begin generating carbon credits via a REDD+ project. REDD+ seemed like a good option to some of these leaders, who had been searching for a way to secure a more sustainable use of their lands for many years. They soon began developing a project with the support of the community, thus beginning the process to reconcile what those defining and promoting REDD+ meant by conservation with their own local understanding of conservation. Six years later, the community of COCOMASUR has learned much about REDD+, coming to see for themselves the difference between the narratives first shared with them, and how REDD+ has worked in practice. They have overcome many trials to become the first project in Colombia to be validated and verified and to receive carbon credits to sell. Challenges continue, including from the inconsistency of the carbon market. COCOMASUR has used these experiences of reconciling narratives to create their own stories, which they are sharing with other communities around Latin America that are considering participating in REDD+.

RED LISTING HUMAN BEHAVIORS THAT IMPACT GLOBAL BIODIVERSITY

Matthew Selinske, RMIT University; Sarah Bekessy/ RMIT University; Fiona Fidler, University of Melbourne; Georgia Garrard, RMIT University; Ascelin Gordon, Victoria; Manfred Lenzen, University of Sydney; Isaac Peterson, RMIT

Satisfying the United Nations Sustainable Development Goals (SDG) of sustainable consumption and production (SDG 12), halting biodiversity loss, and sustainable use of

marine (SDG 14) and terrestrial ecosystems (SDG 15) are dependent on identifying major threats to biodiversity and ending or reducing their impact. The major drivers of these threats—biological resource use and land clearing—are the consequence of behavioral patterns amongst multiple individuals in the globalized economy, the highly complex and sometimes hidden interchanges of goods and services across international borders. The link between consumptive behaviors and the biodiversity impacts of these behaviors are generally diffuse, making them difficult to examine. To better determine impacts of consumptive behaviors on global biodiversity, we integrate the IUCN Red List Threatened Species Database with a global input-output economic analysis that allows identification of the link between the origins of a commodity, through to the end point of consumption, and the subsequent biodiversity loss driven by this consumption. The input-output analysis disentangles complex trade pathways and with the Red List database provides an understanding of which globally traded commodities have the greatest impacts on biodiversity and the behaviors that drive them. We prioritize anthropogenic threats by focusing on particular geographic regions (e.g. biodiversity hotspots, specific countries) and what industries have the highest impact on threatened species or groups of species (e.g. highest conservation priority species). Using projected patterns of consumption and impact analysis via the Multiple Region Input Output architecture we assess future biodiversity loss and consider the potential implications for biodiversity. We also discuss some of the limitations of using an input-output analysis with the IUCN Red List and potential ways to improve this as a policy decision-making tool.

REDUCING CARBON EMISSIONS AND ATTAINING CO-BENEFITS FROM TIMBER PRODUCTION LANDSCAPES IN BORNEO

Rebecca Runting, The University of Queensland; Oscar Venter, University of Northern British Columbia

The land sparing verses sparing debate has previously been dominated by agricultural landscapes, with little attention paid to forest management strategies, especially in the tropics. This is particularly concerning, as there has been a growing trend towards industrial timber plantations in the tropics at the expense of natural forest selective logging. Essentially, many areas in the tropics are transitioning towards a land sparing approach to forest management, with scant evidence that this approach can provide benefits beyond timber production. At the same time, the emergence of major forest-carbon financing and policies are beginning to incentivise the management natural forests for multiple values (a land sharing approach). Simultaneously achieving timber sector production targets, forest emissions reductions targets, and a range of co-benefits for biodiversity and ecosystem services is a challenging task. Should different forest uses be separated to deliver timber production and emissions reduction targets in separate locations (sparing), or should forest management be integrated for both timber production and conservation objectives (sharing)? We answer this question for the forests of the East Kalimantan province, Indonesia, which has been selected as a World Bank REDD+ implementation site to pilot broad-scale emissions reductions. We used integer linear programming to explore the optimal allocation of forest management strategies to achieve biodiversity and ecosystem services benefits for a fixed level of timber production across the continuum of land sparing to sharing. We will present our findings on whether land sparing, land sharing, or a mix of strategies, is optimal across the range of management objectives.

REDUCING DEMAND FOR WILDLIFE: HOW ARE WE DOING?

Diogo Verissimo, Rare, Johns Hopkins University; Anita K.Y. Wan, Consultant

The unsustainable trade in wildlife is a key threat to the Earth's biodiversity. While efforts to mitigate this threat have traditionally focused on regulation and enforcement, there is a growing interest in campaigns aimed at reducing the demand for wildlife products. This has led to the implementation of dozens of outreach efforts across several countries, species and target audiences. Yet, we know little about how this effort has been distributed, the types of activities carried out and the impact achieved by them. Our goal is to describe the demand reduction efforts conducted to date and characterize the existing evidence around their impacts. Through a review of the academic literature, grey literature databases, and NGO websites, we found evidence of about 85 different campaigns, almost all outside of the academic literature. These unsurprisingly focused mostly on the Asian continent, and species such as tigers, elephants and rhinos. Nonetheless, it is clear that this is an incomplete portrait and that many of the demand reduction efforts did not have accessible documentation. Regarding evidence of impact, although nearly two thirds of campaigns reported outputs, less than 20% did so for outcomes and only about 1% reported any information around impacts. This suggests that, at present, it is difficult to know whether conservation campaigns to reduce demand for wildlife products are having an impact and, consequently, also challenging to draw lessons learned to inform future efforts. If demand reduction campaigns for wildlife products are to become a cornerstone of the efforts to combat the unsustainable

trade in wildlife, we must increase the reporting of the activities being implemented and ensure that robust impact evaluation is carried out in a way that allows past intervention to inform future ones.

REEF RESILIENCE THROUGH ASSISTED EVOLUTION: CAN WE CLIMATE-HARDEN THE REEF ENGINEERS?

Line Bay, Australian Institute of Marine Science

Reef-building corals are sensitive to ocean warming and climate-driven declines in coral cover and species diversity are evident on many, if not most, reefs around the world. Even under a best-case CO2 emission scenario and most corals will not persist unless they become more tolerant to conditions that are currently causing stress. Modeling studies suggest that moderate levels of adaptation are sufficient to vastly enhance the outlook for corals over the near future. Consequently, the success of conservation and restoration approaches will be improved if climate resilient corals are used. This talk will outline the evidence for rapid temperature adaptation of corals and the mechanisms by which this can occur. These mechanisms are diverse and include genetic adaptation, epigenetic hardening and changes in symbiotic interactions. I will then explore the rationale behind human-assisted evolution (AE) for increased temperature tolerance and outline early results for corals that capitalize on their unique features including broadcast spawning and photo-symbiosis. In particular, I will focus on how standing genetic variation for thermo-tolerance can be harnessed through spatial management, assisted gene flow and captive breeding to climate harden vulnerable reefs. Empirical and modeling examples will be used to explore the efficacy of assisted gene flow to increase the resilience of reef ecosystems in relatively good and degraded condition. I will conclude the talk with an exploration of significant knowledge and communication challenges associated with the adoption of AE in coral reef restoration in the future.

REFRAMING FOOD RESEARCH AND POLICY TO CONNECT ECOLOGICAL AND SOCIAL OUTCOMES IN SOUTHEAST ASIA

Federico Davila, The Australian National University;

Southeast Asia is home to high biodiversity, much of which remains in rural landscapes. These landscapes also have human populations in poverty and high incidences of food insecurity. Many of food security policies in Southeast Asia have been driven by the idea that food security can be achieved through prioritising market supply of staple commodities. These ideas, however, have not delivered adequate human development outcomes, and continue to promote the modification of landscapes, threatening biodiversity. Shifting the dominant focus on core commodities is highly complex, as public, private, and research institutions have been set up to frame agriculture through a market surplus perspective. I will present qualitative findings from interviews with smallholder farmers, researchers, and policy makers from Southeast Asia. The perspectives and ideas indicate the challenges and opportunities for changing the focus on markets and single commodity production. I discuss these findings from a human ecology perspective, through focusing on the role that dominant values play in influencing ecological and social outcomes. I examine the opportunities for increasing smallholder participation in a range of research and policy initiatives in Southeast Asia and embedding their knowledge into future policy design. The presentation will show the value of exploring the issue of food security from a human ecological systems perspective and including different stakeholders through the research process.

RELIGIOUS AND CONSERVATION COLLABORATION YIELDS SUCCESS AT HOLY WISDOM MONASTERY

Sister Mary David Walgenbach, Holy Wisdom Monastery

Aided by conservation biologists and partnering with environmental, civic, and community groups, the Benedictine Sisters (Order of St. Benedict) at Holy Wisdom Monastery have been restoring prairies, savannas and woodlands and protecting a 10,000-year-old glacial lake in the middle of the State of Wisconsin of the United States of America for over sixty years. Native species are flourishing within the 130 acres of Holy Wisdom Monastery as efforts continue to advance the harmonious functioning of the diverse animals, vegetation, land, water and air. Scientifically-informed awareness of the interconnections of the monastery land, bordering lands, and nearby Lake Mendota within the Yahara River Watershed has prompted changes aimed at preventing erosion, phosphorous runoff, and other problems from occurring. Concern about the adverse effects of fossil fuels has resulted in a commitment to greater energy efficiency, solar electrical generation, and geothermal heating and cooling of buildings. Environmental education at Holy Wisdom Monastery through building and grounds tours, conferences, lectures and training programs allow the Sisters to share their conservation experiences and knowledge with school groups, faith-based groups, government groups, environmental groups and individuals. Motivating the Sisters' efforts is their Benedictine value of reverence for God's creation through which they believe faith-filled people can experience the presence of God. This religious sensibility continues to inspire them to

collaborate constructively with conservation scientists in restoring, conserving, and preserving biological diversity. Projects that have been completed, are underway, and are planned for the future will be highlighted during this presentation by Sister Mary David Walgenbach, Prioress of Holy Wisdom Monastery.

RESEARCHING BELIEFS TO DESIGN BEHAVIORAL CHANGE INTERVENTIONS, A PATH TOWARDS SUSTAINABILITY

Patricia Manzano Fischer, UNAM; Cecilia Silva Gutiérrez, UNAM

We are born in a family and into a society that teaches us how to behave in the community or country we are part of. Our behavior is influenced by extrinsic (politics, laws, culture, family) as well as intrinsic factors (taste, comfort, beliefs). Our beliefs and habits have an impact in our world, from the transportation we use, to what we eat every day. This impact can be reduced if we identify key factors that can be changed to live a more sustainable life. Psychology use a wide variety of tools and methodologies to modify or change behavior. To influence this change, we need to investigate what are the beliefs or habits behind it. Interventions should be designed based on information about what beliefs or habits influence the behavior we pretend to modify. This kind of methodology could be more efficient and effective in terms of long lasting changes. It has been shown that once we make a first change in our habits, it is easier to make more. We could be on the path to a more sustainable way of life. What we eat has different impacts on the ecosystems. We make decisions about food at least 3 times a day for each meal, therefore, choosing to reduce our footprint can be an individual strategy to greatly reduce our impact.

RESOLVING CONTROVERSIES IN COMPENSATORY CONSERVATION

Martine Maron, The University of Queensland

Compensatory approaches to achieving conservation and other valued societal needs (ecosystem services) in the face of development are gaining importance globally. Increasingly, governments and proponents of development are turning to compensatory mechanisms, such as offsets, to counterbalance unavoidable biodiversity and ecosystem service impacts from development and build license to operate. Biodiversity offsetting is perhaps the most well-known compensatory approach, but it is not the only one, nor is it necessarily the most appropriate in a given context. In this talk, I review the key challenges to sound compensatory conservation, and suggest ways forward for pragmatic conservation in the face of development beyond offsetting. While offsetting – if done well - represents a very strict standard, with trading restricted to within narrow categories of biota and a goal of at least 'no net loss' of biodiversity, the most effective type of compensation will depend on a large range of factors. Actions that fall short of pledges such as no net loss can present a reputational risk for business, which can be a disincentive to engage in offsetting. No net loss outcomes in many cases may be incompatible with development, strict like-for-like requirements may mean that opportunities for better outcomes for higher conservation priorities are missed, and different approaches to trading biodiversity losses for gains have different implications for local communities affected by both sides of the exchange.

RHINO HORN: PERSPECTIVES IN TRADITIONAL CHINESE MEDICINE

Hubert Cheung, University of Queensland

Rhinoceros horn has been used for millennia in traditional Chinese medicine (TCM). Despite a CITES ban on international trade that has been in place since 1977, rising wealth in Asia has driven a dramatic increase in demand and poaching over the last decade, with over 1,300 rhinos killed in 2015. Fewer than 20,400 white rhino and 5,300 black rhino remain in their African range states. Existing conservation strategies revolve around poaching deterrence, regulatory enforcement and demand reduction campaigns. With poaching only expected to increase in the near future, these measures are clearly no longer able to contain the rhino poaching crisis, and other solutions must be considered. A strictly regulated legal trade in sustainably harvested or synthetic horn has been proposed to simultaneously satisfy demand and achieve conservation goals. However, the trade legalization discussion cannot be properly informed without understanding the nuances and complexity involved. A series of pilot interviews were conducted in Hong Kong with TCM practitioners in 2015 to explore their familiarity with rhino horn, perspectives on trade legalization and sustainably harvested horn, and views and experiences regarding its medicinal application. Further research is being conducted to investigate the TCM demand for rhino horn in mainland China, of which a deeper understanding will facilitate more informed and effective policy-making for the conservation of rhinos in the wild.

RICH COMPOSITION AND CURIOUS DYNAMICS OF A TROPICAL WETLAND SOUNDSCAPE

Benjamin Gottesman, Purdue University Center for Global Soundcapes; Emma Beck, Purdue University Center for Global Soundscapes; Kristen Bellisario, Purdue University Center for Global Soundscapes; Taylor Broadhead, Purdue

University Center for Global; Dante Francomano, Purdue University Center for Global Soundscapes; Amandine Gasc, Center for Global Soundscapes; Maryam Ghadiri, Purdue University Center for Global Soundscapes; Cristian Graupe, Purdue University Center for Global Soundscapes; Javier Lenzi, Purdue University Center for Global Soundscapes; Hishem Omrani, Purdue University Center for Global Soundscapes; Bryan Pijanowski, Purdue University Center for Global Soundscapes; Jack Vanschaik, Purdue University Center for Global Soundscapes; Zhao Zhao, Purdue University Center for Global Soundscapes

Most of Earth's biodiversity resides in places that are difficult to monitor. Soundscape ecology, through the use of passive acoustic monitoring, has now characterized patterns of biodiversity in many terrestrial and aquatic ecosystems. In order to use this approach as a tool for measuring environmental change, one first has to comprehensively describe a soundscape in order to establish an acoustic baseline. Here, we aim to describe the composition and dynamics of an endorheic wetland located in the La Selva Biological Station in Costa Rica. We pursued two complementary methods of acoustic analysis—detailed description of biological sound types and the calculation of acoustic diversity indices—and we analyzed these data in the context of environmental conditions including solar radiation and precipitation. We also measured the degree of correlation between our manual and automated analyses. Through these data, we were able to 1) reveal a high diversity and density of biological sounds and 2) describe the diel acoustic activity patterns of the underwater acoustic community. Surprisingly, the diel soundscape of this wetland differed strikingly in comparison to other habitat types, where dawn and dusk are usually periods of high acoustic activity. At this wetland site, dawn and dusk were nearly silent, while all other times of day were saturated with biological sound. We pose potential explanations for these periods of quiet in the context of life history strategies, predator-prey relationships, and the acoustic niche hypothesis. This study is the first known description of a tropical freshwater soundscape, and can serve as a starting point for acoustically documenting these hotspots of biodiversity. Long-term acoustic monitoring is a window into remote habitats, and also highlights interesting aspects of animal communication, making it a powerful tool to learn about and protect these places.

ROBUST STRATEGIES FOR CARBON POLICIES TO MAXIMISE BIODIVERSITY CO-BENEFITS

Elizabeth Law, University of Queensland; Brett Bryan, Deakin University; Tim Capon, CSIRO; Rochelle Christian, Department of Environment, Australia; Shaun Cunningham, Deakin University; Sue Eber, WWF; Marit Kragt, UWA; Martin Nolan, CSIRO; Michael Perring, UWA; Anna Renweick, University of Queensland; Rebecca Runting, University of Queensland; Kerrie Wilson, University of Queensland

Carbon payments can bolster biodiversity conservation through incentivising reforestation of agricultural landscapes. However, this may require carbon payments to be coupled with policy mechanisms to specifically support biodiversity co-benefit objectives, for example regulation of eligible reforestation types, targeting of reforestation areas, and complementary incentives. Fourteen alternative carbon policy mechanisms incentivising carbon plantings and environmental plantings were evaluated for Australia's agricultural land, under scenarios of global change. Uniform payments would likely result in significant carbon sequestration, but few biodiversity co-benefits. Regulating to restrict the scheme to environmental plantings only, or introducing a biodiversity premium or carbon levy, could increase biodiversity co-benefits, but was mostly inefficient. Discriminatory payments (such as reverse auctions) with multifunctional targeting of both carbon and biodiversity increased biodiversity co-benefits 100-fold, with little cost to carbon outcomes. Results were robust to uncertainties in global outlooks and adoption hurdles. While these results suggest clear policy directions, ultimately society needs to decide the desirable amount of carbon and biodiversity co-benefits, and the price it is willing to pay for them.

ROOT FUNCTIONAL TRAITS AT ALDER PLANTATION AND SECONDARY FOREST

Jaime Estévez-Varón, Universidad de Caldas; Dolors Armenteras, Universidad Nacional de Colombia; Santiago Barco, Universidad de Caldas

The abandoned lands have allowed the development of secondary forests and plantations for protection or production; those become a relevant component of world forest resources and have an important role in the context of sustainable forest management. The richness and species diversity have been widely assessed at plantations; however, the functional aspects have been little study. Specifically, the root biomass and functional traits can give information about carbon budget, and plant ability to obtain nutrients and water of soil. We assessed the root biomass vertical distribution and root functional traits such as mean root diameter, root length, and specific root area, at eight Alder plantation and eight secondary forest plots. We found that secondary forest and Alder plantation differ in the root biomass with high values at the secondary forest. The root functional traits did not differ between forests. The abilities of Alder plantation and secondary

forests plants to get the nutrients and water are similar, whereas the carbon budget in the root differ.

RULES VERSUS REALITY LIMITS TO INDUSTRY CAPACITY WHEN PLANNING FOR NNL AT THE LANDSCAPE SCALE

Hugo Rainey, Wildlife Conservation Society; Hugo Costa, Wildlife Conservation Society; Hedley Grantham, Wildlife Conservation Society; Fabien Quétier, Biotope; Ray Victurine, Wildlife Conservation Society; Raymond Victurine, WCS; Amrei von Hase, Forest Trends

Best practice for development projects, such as infrastructure, mining and oil & gas, typically requires aiming for no net loss of biodiversity. Policy and financial investors generally require developers to consider direct, indirect and cumulative impacts on biodiversity when planning project activities. Development projects find it challenging to achieve no net loss targets. Indirect and cumulative impacts can be complex as they result from many contributing factors. Management of indirect and cumulative impacts may be particularly difficult, especially at a landscape scale beyond project license areas. Mitigation of these impacts can require a wide range of expertise, influence and approaches which may be difficult for a developer to engage and sustain. Analysis of a range of common impacts on biodiversity by development projects indicates opportunities to improve mitigation outcomes. Here we discuss how guidance and regulations for mitigating landscape scale impacts on biodiversity can be adapted to aid successful outcomes. Project developers and other stakeholders may achieve better biodiversity outcomes at the landscape scale through improved consideration of some planning and management options: (1) Recognition that development project capacity to manage impacts on biodiversity in the landscape beyond the project area can be limited. (2) Recognition that management of complex impacts at large spatial scales requires multiple partners, stakeholder support and broad expertise. (3) Reinforcement of the long-term motivation of communities for managing biodiversity and natural resources can stabilise resource use. (4) Reinforcement of the role of government in managing impacts at landscape scales based on their authority over planning can reduce cumulative impacts. (5) Improved technical support for land use planning and implementation of land use plans can improve biodiversity outcomes and reduce risk to developers.

SAVING THE MONARCH BUTTERFLY REQUIRES INTERNATIONAL COOPERATION IN A TIME OF HOSTILITY UNDER TRUMP

Tierra Curry, Center for Biological Diversity

The monarch butterfly has declined by more than 80 percent over the past 20 years. The world's largest population of the butterfly undertakes a multigenerational migration annually from breeding grounds in Canada to winter in the forested mountains of Mexico. Scientists estimate that there is nearly a 60% chance the migration could collapse within the next 20 years. Many national and international efforts are underway to safeguard habitat but these initiatives are now under threat by the Trump administration which is hostile toward endangered species and is straining the relationship of the U.S. with Mexico. The iconic orange and black butterfly is of symbolic importance to all three countries as an emblem of free migration and connected ecosystems. The monarch is under review for protection under the U.S. Endangered Species Act, has been recommended for endangered protection in Canada, and in Mexico is a species subject to special protection. The U.N. has been petitioned to list the Monarch Biosphere Reserve as an endangered World Heritage Site and the IUCN has recognized the migration as a threatened process. Protecting the migration will require international cooperation but Trump will undermine the monarch's future by defunding national and international efforts, deferring to the pesticide industry, and promoting climate change, which is a dire threat to the monarch range wide. Due to Trump's industry ties, the future of the Federal Pollinator Health Task Force and other initiatives is now uncertain including ESA protection. Loss of milkweed, the caterpillar's only food, is ongoing in the U.S. and Canada, and illegal logging is on the rise in Mexico. The current population (109 million overwintering butterflies) is still well below the threshold (225 million) scientists have determined is minimal to secure the beloved insect's future. Time is of the essence to rebuild the population to a resilient level.

SCENARIO PLANNING: A TOOL FOR CONSERVATION

Sean Maxwell, The University of Queensland

Human influence on natural systems has never been more pervasive. Land-use change, pollution and unsustainable harvesting of natural resources threaten species and ecosystem persistence. Conservation works to ameliorate these negative impacts of people on natural systems, and variety of tools have been developed to help practitioners maximise their effectiveness. However, conservation planning predominately treats anthropogenic threats as

static across time and space. The ensuing management plans are therefore designed to manage threats that do not change, which is a false reflection of reality. Threats to natural systems are dynamic. Agricultural areas expand and contract. Urban areas intensify. Hunting pressure and disturbance events such as fire and oil spills operate as mosaics of impact followed by recovery. This project demonstrates the ecological consequences of ignoring how humans respond to changes in climate, social and economic conditions when developing conservation plans. Using a socioecological model of the Great Serengeti Ecosystem, we design a preferred conservation strategy for migratory wildebeest (*Connochaetes taurinus*), who are threatened by poaching, habitat degradation and climate change. We then compare this strategy to one that is designed whilst considering likely human responses to changing climate and conservation actions. Because human behaviour ultimately drives the spatiotemporal distribution of processes that threaten Serengeti wildebeest, comparing conservation strategies in this fashion may show how seemingly optimal management strategies can become sub-optimal once we integrate human behavioural change into conservation planning. By expanding the use of socioecological modelling to inform conservation decision-making, we hope this study addresses gaps in available and required techniques to successfully plan for dynamic threats.

SEASONALLY DRY FOREST CONSERVATION IN THE COLOMBIAN CARIBBEAN

Santiago Madriñán, Jardín Botánico de Cartagena

Seasonally Dry Tropical Forests are amongst the most endangered ecosystems on Earth. It is estimated that ca. 10% of the original extent of SDTF in the Neotropics remains. In the Colombian Caribbean region, SDTF are particularly endangered through expansion of urban areas and a long history of occupation and destructive land use practices, such as conversion to pastures for cattle ranching and urbanization. In this symposium we will explore conservation strategies of SDTF through five presentations by leading personalities in the field including: 1) an overview of current state of SDTF in the Neotropics (biodiversity, land use, conservation, threats); 2) climate history and future climate change scenarios in SDTF; 3) landscape analyses of extant SDTF; 4) preservation and ecological restoration strategies of SDTF conservation, and 5) economics of SDTF conservation and sustainability through ecotourism, silvopastoral models, community involvement and REDD+ strategies.

SEED BANKING AND HORTICULTURE: COMPLEMENTARY TOOLS FOR THE CONSERVATION, RESTORATION, AND INCREASED GENETIC DIVERSITY OF WILD PLANTS

Eva Martens, Royal Botanic Gardens Kew

For many threatened plant species, seed banking and horticulture have been shown to be complementary methods of ex situ conservation. Joint collecting expeditions allow collections for seed banks and living collections, with the aim of increasing the genetic diversity held in both types of collections. International standards for seed collecting also ensure that the genetic diversity of the wild source population is not compromised, for example by permitting collection of only 20% of the seed available on the day of collection. Whilst some hold the view that seed banks simply preserve seeds ex situ for insurance or posterity purposes, there is also a strong emphasis on the utilisation of collections, which often highlights the strong link with horticulture. For example, at the Millennium Seed Bank in West Sussex the UK Native Seed Hub project aims to mitigate the destructive consequences of habitat fragmentation that endangers UK native species. It does this through providing seed for habitat restoration of UK native wildflowers, one successful example of which is the adder's-tongue spearwort *Ranunculus ophioglossifolius*. Horticulture is particularly valuable in establishing novel germination and propagation techniques to ensure the success of restoration work. This was shown in the case of an extremely rare wild coffee species, café marron *Ramosmania rodriguesii*, found only on the island of Rodrigues in the Southern Indian Ocean - another example of horticulture and seed banking working together to successfully preserve a threatened species.

SETTING CHINA NATIONAL PARKS WITHIN AN ECOSYSTEM SERVICES FRAMEWORK

Siyuan He, Bejing Normal University; Hongguang Cheng, Beijing Normal University; Louise Gallagher, Luc Hoffmann Institute, WWF International; Yang Su, Development Research Center of the State Council, China; Lei Wang, WWF China

About 18% of China is designated to protected areas of some sort, but there is no overarching system for managing them; instead, they are subject to an overlapping mix of polycentric and multi-level administration, hardly reaching an outcome that both biodiversity and treasured human benefits are sustained. In 2016, the Chinese leadership has formally proposed the national park system to initiate the institutional change of conservation management. In the principle of "conservation first and public welfare a priority",

WWF and the government facilitated "China national parks for people" project, acting as a science-policy-practice interface (SPPI) where the three communities communicate frequently to help defend nature not only for nature's sake, but also for people. In this talk I will discuss how by focusing on the synergy and trade-offs of ecosystem services (ESs) the project seeks to develop diagnostic procedures for identifying ES beneficiaries and conservation priorities, and design practical instruments to facilitate institutional changes. Importantly, the diagnostic tools and practical instruments evolve in a way that the project is a hub for information from stakeholders to flow, and the research procedure will continue even after the project ends. Zooming in on the case Wuyishan national park pilot, we have identified major ES demand of local people and potential conflicts between their practice and conservation goals. A key question emerges as how to maintain tea plantation if community land become part of a national park. This matters to land tenure system and management, a major concern of decision makers in the institutional changes, and local government is waiting for solutions. We are forming further practical instruments for discussion, based on on-going communication. Thus, in the SPPI the science will progressively respond to the institutional changes as required by policy makers and practical solutions may eventually apply.

SETTING THE SCENE: AN OVERVIEW OF WILDLIFE TRAFFICKING ACROSS LATIN AMERICA

Adrian Reuter, Wildlife Conservation Society

Latin America covers only 16% of the globe, yet it is home to 40% of the world's biodiversity. As the most bio-diverse region in the world, existing species face several threats including illegal harvest, use and trade to cover existing national and international demand, making it a prime target for illegal wildlife trade. Threats not only impact the species involved, but also existing biodiversity and human livelihoods through potential introduction of diseases and/or invasive species. In addition, an increasing interest in certain species from Latin America and Caribbean (LAC) for markets in Asia and other parts of the world pose an expanding challenge to authorities responsible to tackle illegal activities with extremely limited resources. With over 40 countries and overseas territories in Latin America and the Caribbean, gaps and needs to effectively tackle illegal wildlife trafficking (IWT) in the region significantly vary from country to country and region to region, from small scale trade for local markets to significant transactions of highly sought after illegal goods for international markets involving criminal organizations. This presentation will provide a general overview of wildlife trade and trafficking in the LAC region, its potential impacts at different levels, some of the existing challenges, and opportunities to contribute in efforts to combat this threat.

SHAPING THE FUTURE OF CONSERVATION TECHNOLOGY: THE CURRENT LANDSCAPE

José Lahoz-Monfort, University of Melbourne

Technology has great potential to revolutionise the way we collect data on species and habitats, and provide new tools to support conservation action. Although increasingly used in our discipline, there is still a huge opportunity gap that the conservation community could tap into. Within the ICCB2017, the SCB Conservation Technology Working Group (CTWG) organized the first international Think Tank on Conservation Technology, as part of a global effort to push the technology revolution in our discipline. This one-day pre-conference event gathered like-minded conservation practitioners and researchers, and technologists engaged in conservation, in a mix of talks, workshops and discussions. This first talk reports back on the discussions and activities conducted during the Think Tank, providing an overview of the current landscape of Conservation Technology and setting the scene for the symposium talks.

SMALL MAMMAL ASSESSMENTS AS A TOOL FOR ADDRESSING THREATS TO HABITAT SPECIALISTS

Nicolette Roach, Texas A&M University; Rosalind Kennerley, Durrell Wildlife Conservation Trust; Thomas Lacher, Texas A&m University; Richard Young, Durrell Wildlife Conservation Trust

North, Central, and South America and the Caribbean contain over 1,200 small mammal species – almost 50% of all small mammals. Conservation priority is often given to species with a threatened IUCN Red List status. During 2015 and 2016 we re-assessed all available baseline data on the current status of small mammal species within the framework of the IUCN Red List, to determine their specific conservation requirements using an evidence-based approach. We also examined species with small or restricted ranges (endemics or with ranges less than 50,000 km2) to evaluate the conservation challenges associated with these species. The insular Caribbean has experienced the world's highest levels of historical mammal extinctions, with at least 29 species lost since 1500 AD. Representatives of only two non-volant land mammal families (Capromyidae and Solenodontidae) now survive, and the conservation status of these is poorly understood. We now recognize 13 surviving species, one of which is not formally described and cannot be assessed

using IUCN criteria; three further species previously considered valid are interpreted as junior synonyms or subspecies. Of 643 priority small mammal species assessed in the New World, 49 species had a status change from their 2008 listing. Twenty-six of the 49 species were listed in a threatened category (vulnerable or greater) in 2016. Habitat loss, hunting, invasive species, and climate change represent major threats to surviving species, and conservation of the threatened small mammal fauna will require a range of specific targeted management strategies. We will discuss tools for conducting research for small mammals with small or restricted ranges in the Neotropics, for highlighting species with high priorities for further ecological research, and for prioritizing where urgent conservation actions are needed.

SMITH FELLOWS PROGRAM: IDENTIFYING POTENTIAL AND DEVELOPING LEADERSHIP SKILLS TO INCREASE IMPACT

Shonda Foster, Society for Conservation Biology

The David H. Smith Conservation Research Fellowship Program seeks to develop future world leaders and entrepreneurs who are successful at linking conservation science with management and policy application. Leadership is at the core of the Program in two ways: 1. leadership potential is a primary criterion for selection 2. leadership skills are an important professional development component during the two-year fellowship. The Smith Fellows Program employs an active definition where leadership refers to action(s) and impact as opposed to roles or hierarchical positions. David Smith's story exemplifies this and demonstrates that leadership often requires embracing risk as a component of change. The Program looks for evidence of leadership experience and potential throughout the selection process and explicitly asks for this information in a personal statement and during interviews. Responses that indicate the applicant identified a situation where there was a need or problem and stepped in to fill or solve it tend to be more successful than responses that identify positions applicants have held. Once selected, the Smith Fellows Program provides professional development in addition to individual research funding. In one workshop, Fellows work to develop awareness of their own and others' leadership styles and the ability to adapt given the situational context, thus making them more effective collaborators and leaders. Fellows are encouraged to seek out leadership opportunities and take risks with the support of the Smith Fellows community. We see the Program's emphasis on leadership skills development and solutions-oriented science increasing the Fellows' impact on conservation management and policy.

SOCIAL AND ENVIRONMENTAL PREDICTORS FOR THE SPATIAL DISTRIBUTION OF CONSERVATION EASEMENTS

Paul Leonard, Clemson University; Robert Baldwin, Clemson University

Conservation decisions should be evaluated for how they meet conservation goals at multiple spatial extents. Conservation easements are land use decisions resulting from a combination of social and environmental conditions. An emerging area of research is the evaluation of spatial distribution of easements and their spatial correlates. We tested the relative influence of interacting social and environmental variables on the spatial distribution of conservation easements by ownership category and conservation status. For the Appalachian region of the United States, an area with a long history of human occupation and complex land uses including public-private conservation, we found that settlement, economic, topographic, and environmental data associated with spatial distribution of easements (N = 4813). Compared to random locations, easements were more likely to be found in lower elevations, in areas of greater agricultural productivity, farther from public protected areas, and nearer other human features. Analysis of ownership and conservation status revealed sources of variation, with important differences between local and state government ownerships relative to non-governmental organizations (NGOs), and among U.S. Geological Survey (USGS) GAP program status levels. NGOs were more likely to have easements nearer protected areas, and higher conservation status, while local governments held easements closer to settlement, and on lands of greater agricultural potential. Our results support previous findings and provide an ecoregion-scale view that conservation easements may provide, at local scales, conservation functions on productive, more developable lands. Conservation easements may complement functions of public protected areas but more research should examine relative landscape-level ecological functions of both forms of protection.

SOCIAL MARKETING OF COMMUNITY MANAGED MARINE PROTECTED ZONES IN INDONESIA

Stacey Sowards, University of Texas at El Paso

Rare is a non-profit, non-governmental organization, based in Arlington, Virginia, USA, that works to address conservation issues in Colombia, Indonesia, the Philippines, Mozambique, and Brazil. Started in 1973, Rare has developed a model of "pride" campaigns that are designed to inspire environmental conservation and

community building. Rare recruits campaign managers from local non-governmental and governmental organizations in rural areas facing environmental threats in coastal areas. This presentation focuses on how environmental advocacy campaigns in Indonesia engage local communities and key stakeholders to create community buy-in for new marine protected zones and other environmental initiatives to ensure environmental sustainability and food security within these communities.

SOCIAL-ECOLOGICAL SCIENCE IN THE FIELD: HUMAN WELL-BEING AND COMMUNITY CONSERVATION IN KENYA

Jessica Musengezi, The Nature Conservancy

All major conservation NGOs now want to know how programs impact people, or target human impacts in addition to conservation outcomes. Most struggle to do so in a rigorous way, given the time and resource constraints of on-the ground conservation. Despite the widespread recognition of the complex connections between nature and people, few projects measure human well-being outcomes and there is a lack of evidence for conservation impacts on people. We developed a framework for incorporating human well-being into conservation strategies. We present a case study application in the community conservancies of northern Kenya, where pastoralist communities aim to manage rangelands sustainably for livestock and wildlife. The application demonstrated the challenges of developing a manageable set of indicators, and we highlight the key elements conservation programs should focus on when developing human well-being measures. These include mapping conservation project activities to specific human well-being outcomes, identifying and selecting relevant human well-being indicators, and making informed decisions on monitoring design. In addition, we designed a devolved monitoring system that will allow the practical, replicable collection of human well-being data over time, demonstrating the feasibility of adding social monitoring to conservation programs.

SOLVING OCEAN PROBLEMS THROUGH OPEN INNOVATION: THE BLUE ECONOMY CHALLENGE

Barbara Martinez, Conservation X Labs; Alex Dehgan, Conservation X Labs, & Duke University

Practitioners in conservation biology are finally broadening the tent by partnering and collaborating with other disciplines, experts, and industries. Yet, the field of conservation biology has not fully engaged non-experts and open innovation in solving ocean problems. Other disciplines, like global health, have produced novel, low-cost, and culturally relevant innovations to address health problems in developing countries thanks to public-private partnership spear-headed by the U.S. Agency for International Development. Inspired by that success, Ocean X Labs was created as a joint initiative between WWF and Conservation X Labs to source innovative solutions through open innovation like prizes, challenges, and hackathons to engage and incentivize a diverse community of solvers. This presentation will present a case study of the Blue Economy Challenge (BEC) via data analysis and lessons learned. The BEC provided a monetary incentive for solvers to prototype innovations that would revolutionize the sustainability of aquaculture in the developing world, including ideas to produce fish-free feed solutions, new sustainable products, and sustainable farm designs. The BEC attracted 241 applications from diverse teams in 40 countries. The ideas ranged from fish feed and fish oil sourced from algae, insects, and microbes; integrated multi-trophic aquaculture systems relevant to people and markets living in Indian Ocean countries; methods to sustainably farm algae and other products; and, sensors and aeration devices that are durable and low-cost for the developing world. Ten teams from around the world received prize money from the BEC to further develop their products into sustainable companies – the competition not only provided an opportunity for innovators to bring their ideas into the marketplace, but it also provided Oceans X Labs with a valuable landscape of the solution space that could further open up challenges and contests to technologists and non-scientists.

SOLVING THE HARD QUESTIONS TO INCREASE THE EFFECTIVENESS OF MARINE CONSERVATION

John Cigliano, Cedar Crest College

The global ocean was once thought to be an infinite source of goods and services. Unfortunately, this is not the case. Many marine species are in decline and facing extinction and many ecosystems are being degraded, despite advances in marine-conservation research, policy, and management. We need, then, to ask how we can be more effective in conserving marine species, habitats, and ecosystems? To answer this question, we must first determine the significant gaps in marine conservation efforts. To do this, we conducted a research prioritization exercise during which we identified important questions that need to be addressed but are not, either because they conflict with the interests of scientists, managers, or funders; question dogma; are thought to be outside the realm of "proper" conservation science; include external drivers; or require sizable paradigm shifts to address. We termed these "Kraken in the aquarium" questions—

the marine equivalent of "the elephant in the room" questions. The purpose of this presentation is to provide a broad overview of these questions and to illustrate how they apply outside of the typical realm of influence of conservationists to provide context for the discussions of this symposium, which will present innovative and creative approaches to advance marine conservation. The symposium will conclude with an interactive, open discussion to identify the future direction of SCB's Marine Section and the improvements needed to make marine conservation more effective.

SPATIAL ADAPTIVE MANAGEMENT OF SIBERIAN CRANE CONSERVATION ACROSS EAST ASIA

Arlyne Johnson, Foundations of Success; Erica Cochrane, International Crane Foundation; James Harris, International Crane Foundation

This is a story of our experience managing and learning from the conservation efforts of six different teams in three different countries to conserve the last remaining viable population of a critically endangered migratory crane species. The Siberian Crane (estimated at less than 4000 individuals) travels more than 2500 miles from the vast and remote Siberian tundra, through far eastern Russia, parts of Mongolia, and across some of the most heavily developed and rapidly evolving landscapes of China every year, and back. To manage all of this interconnected work and make sense of data collected across such a range of geographies, we have developed systematic conservation plans using the Open Standards and Miradi software. We have divided the species conservation work into 6 different Miradi project files: one that represents the over-arching flyway/species program and 5 that encompass large geographic areas crucially important for the crane's annual migration cycle. Within each of these areas, there is nested geographic complexity and extensive data being collected with respect to crane use, ecosystem health, and the effectiveness of our management actions. In this presentation, we will share what is working to manage this geographic complexity and what remain our challenges in understanding if our efforts are effective and if species recovery is on track.

SPATIO-TEMPORAL FRAGMENTATION OF ECOSYSTEM SERVICES FOR BOGOTA AND SANTIAGO

Cynnamon Dobbs, Pontificia Universidad Catolica de Chile

Latin America is one of the most urbanized region in the world, where patterns of urbanization are disorganized and disjoint from urban planning, with scarcely known effects for ecosystem services (ES) provision and biodiversity. To address this, we evaluated the provision of three ES in the city of Bogota and Santiago for a 30-year period. Using remote sensing data, models and census data we quantified carbon regulation, climate mitigation and recreation potential. We assessed ES provision changes and their spatio-temporal patterns using fragmentation metrics. Urban vegetation patterns differ between the two cities as a result of climate variability and greening policies. However, the largest changes occurred in the peri-urban and non-urban areas, as a consequence of urban sprawling, with large consequences for conservation. Bogota stored more carbon than Santiago derived from a climate effect between the cities, differences within city were the result of different policies and management. Climate mitigation showed similar behavior between both cities, influenced by global climate, densification and urban sprawling. Recreation potential tends to increase towards the inner-city, increasing their habitat potential, and decrease towards the outskirts of the city, reflecting unplanned urban sprawling and increase population. Fragmentation of areas of high ecosystem services provision decreased for Bogota, while increasing for Santiago. Bogota improved its environmental condition, as evaluated by ES provision, recovering from a 2000's dropdown, while Santiago worsens its environmental condition, even there was an increased in vegetation cover. Vegetation cover showed not to be a sufficient indicator for ecosystem services and the distribution of it becomes highly relevant for informing mismatches between services and vegetation, and relevant for biodiversity conservation. Stating strong green policies showed an improvement of Latin American cities.

SPECIES CONSERVATION PROGRAMS AND THEIR CONTRIBUTION TO OTHER EFFECTIVE AREA-BASED CONSERVATION MEA

Carlos Saavedra, Wildlife Conservation Society; German Forero-Medina, Wildlife Conservation Society

Species-focused conservation initiatives provide a significant opportunity for complementing protected areas, particularly in productive landscapes, like the ones common in the Magdalena Valley and Orinoquia region of Colombia. The Proyecto Vida Silvestre (Wildlife Project) used a landscape species approach to engage communities and individual landowners of private lands in conservation activities that could be compatible with their productive tasks. For this purpose, we relied on various types of conservation "agreements", which imply commitments from the civil society to particular conservation activities or practices. Private Reserves, Conservation Agreements, Fishing Agreements, Beach Protection Agreements, and Conservation Corridors, were implemented in these two

regions, with significant results in terms of commitment and participation by local communities. We discuss the advantages and limitations of some of these mechanisms as opportunities for conservation. We believe that the contribution of these complementary conservation mechanisms needs to be highlighted and disseminated, as they add to representation of priority ecosystem, protection of endangered species, and ecosystem services, that benefit the regions and the country.

STRIVING TO DEVELOP GUIDELINES FOR ENGAGING FAITH COMMUNITIES IN CONSERVATION PROJECTS

Jame Schaefer, Marquette University, THEOLOGY

Growing interest among SCB members in relating positively to leaders and members of faith communities for successful outcomes of conservation research and practice prompted the Religion and Conservation Biology Working Group to initiate the three-year Best Practices Project with the goal of identifying guidelines for members to consider. The first step of this project was surveying the full membership of the SCB for their experiences when relating to faith leaders and communities. Conducted from 30 May to 10 September 2016, the Best Practices Survey yielded quantitative and qualitative data about positive ways in which conservationists have interacted with faith leaders and communities, negative approaches to avoid, and challenges to interacting with them. These data will be explained in detail during this symposium as a backdrop for presentations by five SCB members who participated in the Best Practices Survey and offered to share their experiences and lessons learned. The next steps of the project will be described, including the workshop that will be held subsequently at this ICCB during which the task of drafting the guidelines will begin, the process for finalizing them, and intention to propose forums on the guidelines at sectional meetings in 2018 and a symposium at the 2019 ICCB at which members will assess the effectiveness of the guidelines when interacting with faith communities and their leaders. Throughout, the SCB nature of this effort will be underscored as having been initiated by and for members with the hope that the guidelines will be helpful to them when planning and implementing research and practices aimed at conserving biological diversity.

SUSTAINABILITY CONSERVATION AND DEVELOPMENT OF LOCAL RIVERINE POPULATIONS IN THE AMAZON VÁRZEAS

Helder Queiroz, Mamirauá Institute

Over the last 20 years, Mamirauá Institute has sought to provide technical and scientific support to local traditional riverine populations in the floodplain forests of the Brazilian Central Amazon, to enable their sustainable use of major components of local biodiversity, as a conservation tool as well as a tool for their social development. Throughout the years, many pilot attempts and best practices experiments have proved successful, and we have begun to replicate them in several points of the Brazilian Amazon floodplain. Initially focusing on populations inhabiting protected areas (conservation units, indigenous areas and quilombola territories), and more recently focusing on areas without official protection, we have realized the higher levels of conservation in areas under sustainable use by traditional populations when compared to other areas, and that the anthropogenic impacts on floodplains forests are lower at those sites. This perception triggered an effort to increase awareness, mobilization, involvement and participation of local riverine populations in the floodplains of the Brazilian Amazon, with support from governmental and non-governmental organizations. Currently, Mamirauá Institute is developing, together with several partner institutions, a large program to support actions for the sustainable use of biological resources by riverine populations (caboclos, native Indians and quilombolas) in floodplain forests in the Amazon, reaching more than 30 protected areas at different levels. We expect that the effects of this program on the conservation of Amazonian biodiversity will be relevant, and also socially beneficial, even considering the many difficulties that Brazil is currently facing.

SCIENCE LEADERSHIP SHAPES ON THE GROUND CONSERVATION

Michael Schwartz, USFS National Genomics Center for Wildlife and Fish Conservation

Strong science leadership will be needed to meet the conservation challenges of the 21st century. Previous discussions amongst the conservation biology community have recognized that conservation biology requires two types of leaders, those who focus on effective conservation science via developing state-of the art science, and those leaders who integrate science into policy, management, and society-at large. While there has been attention paid to the latter, there has been little discussion on how to develop leaders who can identify where conceptual developments are needed for producing actionable science. This is unfortunate as science is a cornerstone of conservation biology, as the initial goals of the discipline were to "provide principles and tools for preserving biological diversity" (Soule 1985). This talk poses the questions: what does science leadership mean and how can science leadership shape on the ground conservation? I start this talk by defining

scientific leadership and identifying the problems of using traditional business leadership goals, strategies, and targets in the arena of science. I attempt to define the essential elements of science leadership, recognizing that science leaders are often not in "command-and-control" situations where they are assigned top-down control of an organization. Scientific leadership can come from the middle of organizations or can be grassroots. Lastly, I highlight the fact that scientists are not often trained to be in leadership roles, but are often thrust into this role as their career matures and their science is applied in conservation activities.

SYNTHESIZING, PRIORITIZING, AND MAPPING SCIENCE AND MANAGEMENT NEEDS IN THE NW BASIN AND RANGE

Tosha Comendant, Conservation Biology Institute

The Northwest Basin and Range Science Synthesis Project is a highly collaborative effort to develop a shared conservation vision for one of the most intact ecosystems in the Western United States. Altered fire regimes, non-native species, land-use, water scarcity, and changing climate all threaten priority species, habitats and ecosystems. The project team is synthesizing and augmenting existing information, compiling expert guidance, and reviewing existing plans to characterize current condition, future threats, and develop strategies for conservation targets in the Northwestern Great Basin ecoregion (OR, NV, and CA). Project outcomes include: (1) shared conservation priorities supporting working landscapes and healthy populations of plants and animals; (2) maps of core habitats, corridors and community values; (3) assessments of climate vulnerability and development of adaptation strategies; and, (4) an adaptive management framework to support future conservation. Coordinated by the Great Basin Landscape Conservation Cooperative, project partners include state and federal resource managers, tribes, non-profits, and private landowners. The Open Standards for Practice of Conservation are being used as a primary tool to conceptualize and share ecological information across jurisdictional boundaries. Miradi, a tool to support the Open Standards, was used to represent and document Key Ecological Attributes (KEAs) and indicators across the region. In this project, KEAs are assessed at multiple spatial scales using different analysis units, such as watersheds, management units, and ecoregional boundaries. Maps representing the condition of a subset of targets (e.g., aspen woodlands, pronghorn, riverine corridors, and wetlands, seeps and springs) will be presented. An interactive data sharing and mapping platform called the Great Basin Conservation Planning Atlas will be used to disseminate and support partners in the application of strategies and actions.

SYSTEMATIC REVIEW: INDIGENEITY, COMMUNAL TENURE, AND SOCIO-ECOLOGICAL CONDITIONS ON FORESTED LANDS

Samuel Dupre, University of Maryland, Baltimore County; Joel Baker, University of Maryland, Baltimore County, UMBC; Amy Duchelle, Center for International Forestry Research, CIFOR; Margaret Holland, University of Maryland, Baltimore County, UMBC; Steven Lawry, Center for International Forestry Research; Yuta Masuda, The Nature Conservancy; Brian Robinson, McGill University

Policy literature on environmental conservation in developing countries often conflates indigenous and non-indigenous community land use and tenure arrangements as "traditional," and ascribes common attributes to both groups. This tendency towards a universal description of traditional communities restricts us from exploring the more plausible reality that quality of traditional tenure arrangements is not generalizable, but exists rather on a continuum of indigeneity (Radcliffe, 2015). The primary objective of this systematic review is to answer the broad question "How do indigeneity and tenure security influence socio-ecological conditions on community lands in forested regions?" We unpack the bundled term of "indigenous and community lands" by using two lenses (1) indigeneity, and (2) tenure strength via the bundle of rights, in order to better characterize the relationships between community tenure and ecosystem health and community well-being. Specifically, our review investigates the following questions: (1) How do varying characteristics of indigeneity among communities in forested regions influence socio-ecological conditions on those lands? (2) How does the strength of tenure interact with characteristics of indigeneity to influence socio-ecological conditions? Here we present preliminary findings that emerge from our systematic review of the qualitative and quantitative research that exists on the topic of indigeneity, tenure security, and socio-ecological conditions on community lands in forested regions. In addition to meta-analysis of quantitative outcomes from our study set, we compare cases against forest change metrics for the included geographic regions, derived from secondary data (e.g. Hansen et al. (2013) Global Forest Change). To our knowledge, no systematic review has unpacked indigenous and community lands using a lens of indigeneity and tenure security to examine their relative influence on socio-ecological conditions.

TEASING APART ENVIRONMENTAL AND SOCIAL INFLUENCES DURING GROUP MOVEMENT IN FREE RANGING ANIMALS

Maggie Wisniewska, Rutgers University and New Jersey Institute of Technology; Gareth Russell, New Jersey Institute of Technology

The movement of animal groups is driven by multiple influences acting on the group members. Two important natural factors that shape group movement are the physical environment (PE), for instance proximity to water, and social interactions (SIs), such as presence of experienced leaders. However, much remains unknown about how individuals engaged in group movement integrate complex information about their PE and SIs. We developed a hybrid statistical model to simultaneously test for and separate the impact of the PE and SIs. This model uses a resource selection function (RSF) to estimate the effects of PE on individual movement decisions. It also takes into account SIs by converting the positions of neighbors within the group into a distance map, which is then treated as a factor in the RSF. We validated this approach using simulated group movement data from the three-zone model of animal aggregation (based on direction of and proximity between neighbors), and were able to recover both the distance preference for the landscape features and for neighbors. Using empirical data from a group of 16 domestic goats in Tsaobis Nature Park, Namibia, we then demonstrated individual preference for distance to neighbors (close), the shepherds (far), and vegetation (ranging between close and intermediate). Our work provides a new tool to examine the interplay between the PE and SIs during group movement in free ranging animals, and aims to promote more multi-tracking of social animals in the wild.

TESTING WHETHER BIODIVERSITY INDICATORS DETECT POLICY INDUCED CHANGE IN MARINE ECOSYSTEMS

Emily Nicholson, Deakin University; Alberto Barausse, University of Padova; Ben Collen, UCL; E.J. Milner-Gulland, University of Oxford

Biodiversity indicators provide vital information on the changing state of nature, and are used to measure progress towards global biodiversity targets, guide policy, and inform management interventions. Of the suite of indicators designated for such a role, few have been subjected to scrutiny on their ability to represent trends of interest, particularly in guiding policy choices. Here we combine model predictions of the impact of two broad fisheries policies to assess the performance of three biodiversity indicators in evaluating changes in multiple marine ecosystems. The three indicators, the Red List Index, the Living Planet Index and the Marine Trophic Index, are associated with monitoring progress towards the Aichi Targets of the Convention on Biological Diversity. We find that data bias in the indicators can compromise their ability to track change reliably. For example, taxonomic bias can have substantial effects on the Red List Index and Living Planet Index, although this varies by region. The Marine Trophic Index is rendered unreliable due its dependence on catch or landings, as found by previous studies. To better guide policy choices, we recommend indicators are designed to specifically inform environmental management, in particular by examining impacts of data gaps and biases, and how systematic and structural biases can be overcome. Further work is required to modify general ecosystem models to respond appropriately and realistically to anthropogenic pressures. With these modifications, indicators have the potential to tell us how we can best conserve biodiversity, not simply that we are failing to do so.

TETE ARE NE NNE (ANCIENT THINGS ARE TODAY): INTEGRATING LOCAL NARRATIVES INTO AFRICAN CONSERVATION

Domingos Muala, Gorongosa Restoration Project; Kaitlyn Gaynor, University of California - Berkeley

"The soul of a tree is shade. The soul of grass is dew. Everything is useful. Everything speaks." Fernando Jequicene discussed these ecological linkages with 27 other elderly men and women at sachem Pereira Manuel Sadjungira's home, in eastern Mount Gorongosa, central Mozambique. As a representative of Gorongosa National Park's community outreach team, I was here to understand why the elders were against washing blackened pots and pans in rivers and streams. I found myself listening and learning about tembo (totems), the souls of trees and grass, about everything that is useful and speaks. Half of the elders at the meeting were tembo themselves. Instead of killing and eating the common scimitarbill and zebra as other clans do, they protect this wildlife. "Each clan learned its totem from the ancestors and the purpose has been to protect and balance resource consumption," Sadjungira explained. And the washing of used utensils in streams and rivers are prohibited in Gorongosa because the water must run clean for tembo along the basin. Over the last ten years, I have documented these socioecological narratives and other conservation stories about exclusionary preservationist ideologies of the colonial era, and current perceptions of national and international conservation and development efforts through the Gorongosa Restoration Project. In this presentation, I will explore how a gradual but mutually agreeable

integration of local stakeholders' folklore and narratives into Gorongosa National Park's decision-making is uniting locals, nationals, and international environmentalists in the conservation of the nation's flagship national park.

THE BIODIVERSITY INDICATORS DASHBOARD: TOWARD A SPATIAL FRAMEWORK OF BIODIVERSITY STATUS AND TRENDS

Healy Hamilton, NatureServe; Xuemei Han, NatureServe; Bruce Young, Natureserve

As the rate and magnitude of global change impacts to biodiversity and ecosystems rapidly increases, demand for indicators of biodiversity status and trends is on the rise. Biodiversity indicators are used by diverse stakeholders to support reporting on progress toward multilateral environmental agreements and assessments such as the CBD and IPBES, to help prioritize where to focus limited conservation resources, and to help understand what actions contribute to slowing or reversing biodiversity decline. Indicators are most useful when they can translate across spatial scales, from local to national to global. This is best accomplished when they are generated by a combination of remotely sensed data with on the ground field observations. Developments in technology are facilitating a dramatic increase in biodiversity and ecosystem observations from sources as diverse as citizen science and drones, but a lack of standardization in these spatially explicit observations undermines the ability of our community to fully leverage the integration of these data into indicators of biodiversity status and trends. Indicators that serve multiple needs, such as trends in extent and integrity of ecosystems, or trends in species populations, are ideal candidates for development of shared spatial data standards. To maximize the impact of biodiversity indicators on conservation decisions, it is essential to visualize and communicate indicators in an easily accessible format. The Biodiversity Indicators Dashboard (dashboard.natureserve.org) is a flexible, interactive tool for visualization of indicators at multiple spatial scales. The Dashboard is a tool which can serve to communicate the current state of indicators as well as incentivize their improvement. This critical process would be greatly facilitated by the creation of standards for biodiversity and ecosystem observations from diverse, spatially explicit sources that enhance their scalability and interoperability.

THE BOTTLENECK AND THE BREAKTHROUGH: A THEORY OF BIODIVERSITY CONSERVATION IN THE ANTHROPOCENE

Eric Sanderson, Wildlife Conservation Society; John Robinson, Wildlife Conservation Society; Joe Walston, Wildlife Conservation Society

For the first time in the Anthropocene, the global demographic and economic trends that have resulted in unprecedented destruction of the environment appear to be creating the necessary conditions for a possible renaissance of nature. Here we propose a scenario of social-environmental change that incorporates the insights provided by the well-known demographic transition theory and connects it to observed changes in economic consumption and poverty alleviation driven by urbanization. We present data showing how urbanization simultaneously influences all three of the factors of the I=PAT formulation, noting that while these factors have increased human influence on biodiversity in the past, in the future they may drive decreases in human impacts on the environment, creating new opportunities for conservation. Drawing reasonable inferences from current patterns, a hundred years from now the Earth may be inhabited by between eight and ten billion people, very few of whom live in extreme poverty, 70-80% of whom live in towns and cities, and nearly all of whom participate in a technologically driven, interconnected economy. We argue that conservation efforts need to understand and adapt to the challenges and opportunities afforded by rural-to-urban migration, the expansion of towns and cities, and associated changes in poverty and consumption; how will these factors transform our definition of conservation success and what is adequate? How does conservation success change by region and across time? We argue that by recognizing the shifting dynamics of these macro-drivers, conservation has the potential to transform itself from a discipline managing declines ("bottleneck") to a transformative movement of recovery ("breakthrough").

THE BRAZILIAN NATIONAL SPECIES RED LIST AND THE NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

Carolina Marques, International Union for Conservation of Nature; Danielli Kutschenko, International Union for Conservation of Nature; Miguel Moraes, International Union for Conservation of Nature

Brazil is a highly diverse country which hosts near 20% of all known species in the world. It is the richest country in plant species, being more than 40% endemic. The Brazilian diversity and its endemism rates challenge the

national authorities that struggle to ensure effective conservation mechanisms. In this context, the Brazil National Biodiversity Strategy and Action Plan – NBSAP, coordinated by the Ministry of Environment, aims to define a pragmatic framework including: assessment of species extinction risk; implementation of action plans for the conservation of threatened species; and raising awareness on biodiversity. Under the country's NBSAP, the Species Red List has gained more relevance as a key instrument to ensure and promote biodiversity conservation and to influence decisions and policies. In this context, the Ministry of Environment has created in 2014 a National Programme on Conservation of Threatened Species (Prospecies). The Programme was crucial for strengthening the Brazilian National Red List by adopting the IUCN standards for guiding efforts in a comprehensive assessment countrywide. In this context, more than 21,000 species were assessed in the last 5 years with the support of near 1,800 specialists. The current list has 3,285 threatened species, of which 2,113 are plants (501 VU; 1,148 EN; and 464 CR). Certainly, all the efforts described above resulted in significant improvements for the Brazilian legal framework: near 75% of all threatened species are protected by some kind of conservation measure. Nevertheless, 957 threatened species are still completely unprotected. Thus, the Brazilian government foresees measures to protect 100% of threatened species under one of the conservation instruments, especially for those in a more critical status. The strategy is using these species as umbrellas, enabling conservation actions that will actually cover a much bigger proportion of the country's biodiversity.

THE CURRENT TREND IN CONSERVATIONISTS' LIFESTYLE: ARE WE CONGRUENT WITH WHAT WE PREACH?

Karla Pelz Serrano, Universidad Autónoma Metropolitana Lerma; Rurik List, Universidad Autonoma Metropolitana; Patricia Manzano Fischer, UNAM

We conducted an online survey to determine the current trend in conservationists' lifestyles. We sent this survey to listservs of SCB, universities in different parts of the world, to research institutions, zoological societies, etc. We asked 33 questions about their regular lifestyle including food habits, consumer habits, and transportation habits. The 60.32% (n =252) of the respondents consume beef, 53.57% consume tuna sometimes, 45.63% consume wild caught shrimp sometimes, and 33.73% consume farmed salmon sometimes. In terms of consumption habits, 40.48% mentioned to get takeout food sometimes even if the container is made of styrofoam, 49.6% if the container is made of plastic, while only 37.3% would get takeout food only if the container is made of cardboard. Furthermore, 30.56% of the respondents would buy food products sometimes even if the ingredients include palm oil, 34.54% would, even if they contain soy, and 25% even if the products contain GMOs. These results show that a proportion of people dedicated to conservation do not have sustainable habits. We, as conservation scientists, have access to information that allow us to be aware of the consequences of our daily habits, however, that seems not to be sufficient to make our habits more sustainable. This brings the question of which are the triggers that change the lifestyles of people, given that information alone seems not to be enough. The symposium of which this presentation is part of, is an attempt to answer this question.

THE DUAL ROLES OF PROTECTED AREAS IN CONSERVING MIGRATORY BIRDS AND SUPPORTING COMMUNITIES

Amanda Rodewald, Cornell Lab of Ornithology and Cornell University; Amanda Rodewald, Cornell Lab of Ornithology; Viviana Ruiz Gutierrez, Cornell Lab of Ornithology and Cornell University

Improving economic and political situations in much of Latin America have fueled development and resource extraction, resulting in continued habitat degradation and fragmentation, loss of biodiversity, and deterioration of ecosystem services upon which human populations depend. Traditional protected areas that set large areas of land aside from human use are unlikely to stem these threats because many of the most biodiverse regions are dominated by working landscapes, where local communities use the land for agricultural or forestry products. Many of these landscapes are embedded within established protected areas that explicitly accommodate human activities. Effective conservation and environmental stewardship within protected working landscapes require the identification of creative and flexible approaches to sustain both human and non-human ecological communities. We draw from our ongoing work in Central America to illustrate how big data can support novel approaches to financing, monitoring, and sustaining community-based management of natural resources to support livelihoods and conservation.

THE EFFECTIVENESS OF PROTECTED AREAS IN REDUCING PRESSURE

Jonas Geldmann, University of Cambridge; Andrew Balmford, University of Cambridge; Neil Burgess, UNEP-World Conservation Monitoring Centre; Lauren Coad, University of Oxford; Andrea Manica, University of Cambridge

Human impacts on nature have led to massive biodiversity declines. To avert this human pressure, Protected Areas (PAs) have been suggested as one of the most important tools to halt the loss of biodiversity. Several recent studies have shown that wildlife is persisting in protected areas. However, when investigating what elements of management drive the observed differences (using standardized management assessments across larger scales), most studies have been unable to detect an effect. One reason for this might be, that connecting management to direct changes in biodiversity or habitat extent is complicated requiring large amounts of detailed on-the-ground data which does not exist and with effects occurring over decades. Given the paucity of appropriate data on changes in the state of nature, understanding the ability of PAs to mitigate human pressure or threats can be a useful and necessary alternative approach. Here we use a dataset of Management Effectiveness Tracking Tool (METT) assessments from ca. 2,300 individual protected areas in combination with a global map of change in human pressure: The Temporal Human Pressure Index (THPI), to investigate the correlation between management and reductions in pressure. We use propensity-matching which elucidates whether protected areas are performing better or worse than would have been expected given their location by comparing them with matched counterfactual sites. We combine this with four a priori defined management categories based on established theory from Elinor Ostrom and IUCN: 1) Design and Planning, 2) Capacity and Resources, 3) Monitoring and Enforcement systems, and 4) Decision-Making Arrangements to understand their role in effective PAs.

THE EMERGING PRACTICE OF CONNECTIVITY CONSERVATION - PLANETARY CONSERVATION FOR THE 21ST CENTURY

Gary Tabor, Center for Large Landscape Conservation

If national parks are the model of 19th Century conservation and ecosystem conservation the model of 20th Century conservation, connectivity conservation is at the forefront of 21st Century nature conservation. In 2016, IUCN's World Commission on Protected Areas (WCPA) established the new Connectivity Conservation Specialist Group to service the emerging global practice of ecological connectivity and wildlife corridor conservation. With climate change and the growing human footprint, connectivity conservation is seen as a cornerstone of nature conservation and climate adaptation from the local to the global scale, across land and seas, across jurisdictions and cultures. The new Connectivity Specialist group has three primary mandates: 1. Develop a new conservation designation that can be adopted by nations to protect nature and ecological processes across multiple jurisdictions and satisfy the Convention on Biological Diversity's Aichi Target 11 in achieving connected networks of protected areas; 2. Craft global guidelines for avoiding or mitigating rampant linear infrastructure development (roads, rails, and pipelines) in areas of high biodiversity; and 3. Build a community of expertise to support aquatic and marine connectivity. This presentation will serve as the introduction to a special ICCB symposium on Connectivity Conservation and provide the context for this growing global conservation practice.

THE ENVIRONMENT VS. TROPICAL DRY FORESTS: FUNCTIONAL RESPONSES OF SIX TREE SPECIES TO DROUGHT

Beatriz Salgado-Negret, Universidad del Norte; Carolina Alcazar, Bioversity International; Alejandra Chaparro, Universidad Distrital Francisco José de Caldas; Fabian Garzón, Universidad Distrital Francisco José de Caldas; Jhon Nieto, Instituto Humboldt; Nancy Pulido, Universidad Distrital Francisco José de Caldas; Viviana Salinas, Universidad Distrital Francisco José de Caldas; Elkin Tenorio, Instituto Humboldt; Evert Thomas, Bioversity International

Climate change and fragmentation are major threats to world forests. In seasonally dry tropical forests (SDTF), changes in yearly rainfall variability, longer intervals between wet and dry years and, particularly, a decline in rainfall predicted by climate models, could influence the relative performance of species. Understanding how functional traits related to drought tolerance vary across environmental gradients in SDTF could be important to predict species' responses to these threats. We explored how the magnitude and variability of leaf and wood anatomy traits varied across temperature and rainfall gradients within and among six tree species. Trees growing in drier populations showed leaf traits associated to drought tolerance such as lower leaf mass per area and higher leaf dry matter content. In contrast, wood anatomy traits such as vessels and pits diameter did not vary in most species except for *Astronium graveolens*. The limited plasticity showed by wood anatomy traits, could increase cavitation risk in populations where projections predict higher temperatures, lower rainfall or longer drier seasons. The synergism between climate change and fragmentation in Colombia's SDTF could aggravate this scenario with ecosystem level consequences.

THE FOREST FRONTIER AS THE LINK BETWEEN CONFLICT RISK COCA CULTIVATION AND HIGH BIODIVERSITY AREAS

Liliana Davalos, Stony Brook University

Two conceptual models have been generally used to explain tropical deforestation: an immiserization model in which population growth and poverty are the primary engines, and a frontier model, in which investment to open the frontier is the driving force. While great strides have been made to quantify and understand covariates of deforestation the in northern Andes biodiversity hotspot, a model-free approach emphasizing a diversity of covariates has dominated the narrative regarding regional deforestation. Coca cultivation, a carefully monitored activity incurring in various penalties, has occasionally been singled out. Here we evaluate the evidence for either model by examining data throughout and the region, examining in particular the claim that coca cultivation is a major driver of forest loss. Contrary to prior analyses, there is no evidence coca cultivation is a unique or important cause of deforestation. Instead, coca cultivation is part of a mix of agricultural activities concentrated along the frontier between settled, largely deforested territories, and the forest reserve. Both historical and contemporary data support investment and development of the frontier as the primary engine of forest loss, with few exceptions. While the expansion of coca in protected areas persists as a risk to biodiversity in the Amazonian lowlands, the greatest impact is in the Colombian Andes and Chocó forests, where even small areas of forest loss correspond to great loss. The results suggest a narrow focus on coca cultivation as a catalyst for deforestation might prove ineffectual, unless measures are taken to stabilize the forest frontier and the development model associated with extractive economic development along new roads.

THE FUTURE OF CONSERVATION TECHNOLOGY

Alex Dehgan, Conservation X Labs, & Duke University

In the 3 decades as a scientific discipline and practice, conservation is facing its greatest crisis. Despite winning many battles, it is losing the extinction war. This talk looks to the future of conservation, and contends that conservation science and practice must shift from being a descriptive, discovery-based science to a field that seeks to engineer solutions, and incorporates other disciplines. In some ways, this is happening with the recognition of the value of social sciences in conservation, and exploration of new tools, but such efforts must be expanded. Powerful new emerging technologies, coupled with greater connectivity, offer hope. Technology has gained exponentially in processing power, memory capacity, number of sensors, pixel capacity, connectivity, and storage. New advances in data science, robotics, machine vision, and learning, used for instance for driverless cars, can profoundly increase the scale, efficiency, and leverage of conservation efforts. Current advances in molecular biology are rivaling—and in some cases overtaking—the rate of change that we have seen in computing and information technology. In particular, the development of the gene-editing tool, CRISPR-Cas9, now allows for precise, targeted changes to the genome of living cells, allowing for unprecedented control over cellular organization, regulation and behavior. This allows us to combat emerging pathogens, and invasive species, and develop new products to reduce the drivers of extinction, from beef, seafood, and dairy to rhino horn. New portable molecular technologies will allow us to harness the power of the genome to better combat wildlife trafficking. Advances in microbiology have the potential to eliminate pesticides, antibiotics, and fertilizers and to help dramatically increase productivity in plants and livestock. Ultimately, conservation must redefine itself for the next 30 years, or face the same fate of the species it seeks to save.

THE FUTURE OF CONSERVATION: INSIGHTS FROM CONTENTIOUS DEBATES ON THE ILLEGAL WILDLIFE TRADE

Ray Ison, Open University; Duan Biggs, Griffith University

The illegal wildlife trade (IWT) crisis is one of the foremost and highest profile conservation challenges and over US$1 billion has been allocated to tackle the crises in recent years. The crisis is marked by increasing disparities in income between East Asian countries where products like rhino horn and ivory are in demand by consumers and rural parts of Africa where these products are sourced. The most prominent fora for agreeing to international policy to respond to IWT is the Convention on Trade in Endangered Species (CITES). CITES debates on iconic taxa such as elephant and rhino attract extensive media and public attention. NGOs, including numerous animal welfare organisations that depend on support from citizens in wealthy countries have an active and vocal presence at CITES. Indeed, these NGOs and the supporters that they represent view themselves as key stakeholders in formulating policy responses to IWT. However, the supporters of such NGOs often have limited exposure to, and understanding of the complexities of conservation in low income, rural parts of Africa; nor of the cultural backgrounds and socio-economic and governance circumstances of consumers of products like rhino horn. As a result, the development of nuanced, context specific strategies to tackle IWT is constrained and the polarised debates on IWT have led to fractures within the conservation community itself. The IWT crisis, and the response to it, provides insights into the future of conservation and the challenges the conservation community faces to successfully embrace the 'agnostic

pluralism' necessary to protect and steward biodiversity in a multi-polar, multi-cultural, but highly connected world.

THE GLOBAL OCEAN REFUGE SYSTEM INITIATIVE TO SCALE UP THE QUANTITY AND QUALITY OF MPAS

David Johns, Marine Conservation Institute Board, Portland State University; Lance Morgan, Marine Conservation Institute; Sarah Hameed, Bodega Marine Laboratory, University of California, Davis

Marine protected areas (MPAs) are effective conservation tools that can rebuild populations from exploitation, recover habitats from damage, mitigate threats caused by other human activities, and increase resilience to climate change when designed well and managed effectively. However, despite a rich scientific literature on MPA effectiveness, science is not typically a primary driver of MPA design and implementation, leading to variable MPA effectiveness and poor habitat representation of marine protected areas globally. Currently, despite over 13,000 designations that meet the International Union for the Conservation of Nature (IUCN) definition for marine protected area, only 1.6% of the ocean is strongly protected (i.e., areas with no or minimal extraction of natural resources), and most of that area is contained within just 10, very large marine reserves. The vast number of MPAs marginally contribute to biodiversity conservation. This coverage is far short of agreed-upon MPA objectives laid out in the Aichi 11 target of the Convention on Biological Diversity and goal 14.5 of the Sustainable Development Goals that aim for 10% MPA coverage by 2020. Much of the challenge is in effectively protecting these habitats. New conservation strategies are needed to promote the creation of more MPAs as well as more effective ones, however no structure to improve or accelerate effective MPA implementation currently exists. To safeguard marine ecosystems on a global scale, robust science-based criteria are needed for evaluating MPA effectiveness. This talk presents a strategic initiative led by the Marine Conservation Institute called the Global Ocean Refuge System (GLORES). This initiative sets standards to improve the quality of MPAs and catalyze strong protection for at least 30% of the ocean by 2030. GLORES provides a comprehensive strategy that employs the rich body of MPA science to scale up existing marine conservation efforts.

THE GORDIAN KNOT: NAVIGATING THROUGH THE FUTURES OF WILDLIFE MANAGEMENT IN THE COLOMBIAN AMAZON

Nicole Ponta, ETH Zurich; Claude Garcia, CIRAD - ETH Zurich; Nathalie Van Vliet, CIFOR

In spite of the intense urbanization, indigenous people of the Colombian Amazon still rely on wildlife hunting and trading in order to satisfy their livelihood requirements. The growth of the wildlife trade raises concerns about the implications that overharvesting might have on biodiversity and on the people that depend on it. These concerns are shared by the scientific community, government bodies and the local communities themselves – in our case the Ticoya indigenous reserve - who are willing to explore management scenarios. By acknowledging the hunters' empirical knowledge and aspirations and continuously integrating their feedbacks, we co-designed a role-playing game aiming at understanding and discussing hunting strategies under plausible futures. The region is experiencing a rapid transformation. Profound socio-economic changes are reshaping people's livelihood strategies. The current national political debate is favorable to participatory management, but its implementation is still a challenge. Local communities need to cope with these changes and devise management strategies in the face of the uncertainties involved. The uncertainty embedded in socio-ecological systems confronts managers with the challenge of the Gordian knot. The complexity can be overwhelming leading to analysis-paralysis. The temptation to use brute force and oversimplifying it is strong. Untying the knot requires embracing its complexity. The complex nature of environmental management, the plurality of knowledge and perceptions involved, the high stakes, together with the power and information asymmetries call for holistic and adaptive approaches that foster collective learning and action. Exploring the "what ifs" can help hunters and other stakeholders understand the risks and consequences of taking particular decisions should one or another future unfold. Being aware of the forces driving us in different directions and of their implications will increase our chances of success.

THE HUMAN INFLUENCE ON FIRE DEPENDENT ECOSYSTEMS, WHERE TO FROM HERE?

Brooke Williams, The University of Queensland

There is potential for negative consequences for the ecological integrity of fire-dependent ecosystems as a result of inappropriate fire regimes. This can occur when asset (property) protection is prioritised over conservation objectives in burn programs. Optimisation of fire management for multiple objectives is rarely undertaken. We use integer linear programming to identify burn-scheduling solutions that cost-effectively achieve asset protection and conservation objectives. An approach to burn scheduling that favours a risk-averse asset protection strategy results in poor conservation outcomes. Conversely, a conservation-focused approach achieves only modest

asset protection benefits. However, when formulated as a multi-objective problem, good conservation outcomes can be achieved with only a small reduction in potential benefits for asset protection. Our conservation-focused approach resulted in substantially more heterogeneity within the ecosystem, which improves ecological integrity, and substantially reduced the area of fire-dependent forest that had exceeded the recommended burn interval. Mathematical optimisation is a powerful framework for informing fire management that improves the prioritisation and scheduling of controlled burns to efficiently achieve management objectives. By quantifying the trade-offs that exist between two competing objectives we demonstrate that compromise solutions can be identified that achieve good outcomes for both objectives. In a transparent and equitable manner, we show that conservation value may be improved within a fire-dependent ecosystem with only modest concession to asset protection performance. Explicitly evaluating trade-offs among competing objectives enables managers to identify potentially undesirable outcomes, and facilitate transparent development of equitable solutions.

THE IMMENSE VALUE OF SCIENTIFIC COLLECTIONS IN CONSERVATION RESEARCH

Gary Krupnick, Smithsonian Institute; W John Kress, Smithsonian Institute

Collections, including animal and plant specimens, collection data, and library materials, are remarkable and irreplaceable sources of information about biodiversity and the history of life on Earth. In addition to playing a critical role in taxonomy, systematics, anatomy, morphology, ethnobiology, and paleobiology, they serve an important role in conservation biology. For example, collections can be used to discover and confirm the identity of a species that it is new to science; provide locality data for conservation assessments; allow for the documentation of cyclic and seasonal phenomena; document occurrences of invasive species; provide data on locality change due to habitat destruction and climate change; provide material for DNA analysis and conservation genetics; provide material for pollution documentation; and, serve as a means of locating possibly extinct species based upon previous locality data. Museums are steeped in a history of sharing and collaboration, exemplified by their long history of collection and scientific exchange, which is a culture fit for conservation. This presentation describes several case studies to illustrate and explore the way scientific collections have and will continue contributing to conservation research.

THE IMPACT OF BENEFIT SHARING PROGRAMS ON PERCEPTIONS OF DEVELOPMENT AND CONSERVATION SENTIMENT

Kyle Clifton, Texas A&M University

The Kruger to Canyons Biosphere (K2C) in South Africa includes national, provincial, and private protected areas (PAs), as well as over 1.5 million people living in relatively high-density communities. The K2C region is designated by UNESCO as an area of high conservation and development importance—priorities often seen as incompatible by local communities while they are marketed in the ecotourism sector as complimentary by many private nature reserves (PNRs). Given the history of removal and exclusion of local Black populations from PAs, relationships between these stakeholder groups have long been fraught with tension. Increased rhinoceros poaching in the region and the 'war on poaching' response further hardens management borders and is damaging to relationships across them—perversely threatening the integrity of the conservation areas. The primary means of garnering community support for PAs is through effective benefit sharing programs. However, there is often a disconnect between the stakeholder groups regarding benefit expectations and perceived impacts. This presentation will outline perceptions of both PNR stakeholders and local community members regarding conflict, development outcomes, and conservation sentiment, and how these perceptions are affected by different benefit sharing strategies. With an emphasis on community perspectives, recommendations will be made regarding effective benefit sharing programs between PNRs and nearby communities that most effectively address development goals and improve relationships to protect the long-term integrity of conservation areas. Findings indicate a misalignment of stakeholder groups' perceptions of development expectations and outcomes, a lack of prioritization of benefit sharing by private reserve stakeholders in light of security concerns, and a correlation between benefit sharing programs that are narrow in focus and positive community member perceptions of development outcomes and private nature reserves.

THE IMPACT OF ENVIRONMENTAL EDUCATION PROGRAMS ON WILDLIFE POPULATION

Samridhi Shrestha, Grand Canyon University

In developing countries, biodiversity conservation and poverty reduction strategies remain as one of the major discourses of the environment and livelihood. Local communities see wildlife as a threat and a nuisance and they view land and natural resources as their base for livelihood. For a successful management of resources

and people living around them, identification and understanding of different stakeholders and their stake in conservation is required. In this research, qualitative research method, face-to- face interviews regarding environmental education programs (EEPs) were collected from officials of governmental, non-governmental and international non-governmental organizations from three different protected areas of Nepal. Published data was used to review poaching of rhinos and tigers over the last decade in Nepal. Results indicate that environmental education programs (EEPs) are provided to local communities by every organization working towards conservation. The EEPs were conducted through eco-clubs or through workshops or groups such as community-forest user group and buffer zone group. Questions regarding the EEPs given by the organizations had many issues since all the organizations did not have a structured education program despite conducting EEPs. Poaching was highest during political instability in the country. However, Nepal was able to reduce rhino poaching in 2011 and 2013 with the help of improved anti-poaching activities implemented by government agencies, NGOs, INGOs and communities.

THE IMPORTANCE OF ADAPTIVE MANAGEMENT IN CONSERVATION

Rosamira Guillen, Fundacion Proyecto Titi; Katie Feilen, Disney's Animals, Science & Environment; Anne Savage, Disney's Animal Kingdom; Armando Valdes-Velasquez, Foundations of Success/Cayetano Heredia University

As the threats facing endangered species and ecosystems increase, finding solutions to conservation becomes of utmost importance. Solutions require identifying threats to species, strategies and actions to reduce those threats, and appropriate metrics to measure the impact on the desired objectives. Since 1987, Proyecto Tití has used a multi-disciplinary approach using scientific research, community development programs, conservation education, and forest preservation programs to reduce the threats of deforestation and the illegal pet trade on the critically endangered cotton-top tamarins (*Saguinus oedipus*). Using adaptive management, Proyecto Tití has developed a five-year strategic plan focused on creating sustainable local incomes, creating alternative fuels, supporting the implementation of the National Plan for Conservation of Cotton-top Tamarins, increasing awareness of cotton-top tamarins and their habitat, developing cotton-top tamarins as a flagship species, deterring the use of wild animal as pets, and restoring and reforesting tropical dry forest. Proyecto Tití monitors their progress along intermediate results, evaluates program successes, and adapts programs to achieve their goals, which is monitored using MIRADI software. The use of an adaptive management plan has helped Proyecto Tití define key partners to support the National Plan for the Conservation of Cotton-top Tamarins and leveraged additional financial resources to support Proyecto Tití's work to reduce the decline of the critically endangered cotton-top tamarin. The use of adaptive management has many significant benefits for conservation planning of threatened ecosystems and species.

THE IMPORTANCE OF ETHNOBIOLOGICAL KNOWLEDGE TO CONSERVATION

John Stepp, University of Florida

There is a growing body of evidence demonstrating the link between biological, cultural and linguistic diversity. This relationship is more than just simple correlations, with support for the notion that similar phenomena sometimes underlie creation, maintenance as well as loss of these diversities. At the core of these relationships is traditional knowledge of local floras and faunas. However, complete ethnofloras and ethnofaunas exist for only a handful of the more than 7000 languages and cultures in the world. The lack of robust ethnobiological data hinders efforts at biocultural conservation. This paper presents some of the theoretical advances that come from having comprehensive ethnobiological inventories. It explores some of the ways in which ethnobiological knowledge itself may be a driver of biocultural diversity. Last, it demonstrates how the field of ethnobiology has laid the groundwork for effective community based biocultural conservation.

THE IMPORTANCE OF WILD MEAT IN THE GLOBAL SOUTH

Martin Nielsen, University of Copenhagen

Wild meat hunting is attracting considerable attention because of the perceived conflict between the objectives of increasing rural household food security and incomes and tropical wildlife conservation. Yet, information on the economic importance of wild meat to rural households is mainly based on small case studies conducted in limited geographical areas with high hunting intensities, which impedes generalization of results. Through a one-year quarterly income survey of 7,978 households in 24 countries across Latin America, Asia, and Africa, we show that 39% of the sampled households 'harvest' wild meat. We estimate that potentially as many as 154 million households across Latin America, Sub-Saharan Africa, and South and Southeast Asia hunt and to some extent rely on wild meat. On average, wild meat subsistence and cash income makes up 2% of households' net income with own consumption accounting for 89%. Reliance on wild

meat is highest at the low end of the income distribution and inversely related to households' reliance on domestic animal income. Seasonally, reliance on wild meat is inversely related to other incomes, suggesting a gap filling function. In combination, this suggests widespread importance of wild meat in rural households' diets. Through an approximated yield-effort curve estimation for community hunting systems, we furthermore show that hunting appears to be economically sustainable in 78% of the observed communities. Hunting in the global south is, therefore, not necessarily unsustainable. Our results imply that where wildlife conservation is a policy priority, its effectiveness would in all likelihood be enhanced through improved rural food security.

THE INDIGENOUS TERRITORIAL AND NATURAL RESOURCES MANAGEMENT IN THE MADIDI LANDSCAPE, BOLIVIA

Kantuta Lara Delgado, Wildlife Conservation Society; Oscar Loayza Cossio, Wildlife Conservation Society

In the last 15 years, WCS Bolivia has been working providing assistance to the indigenous peoples' demands both in consolidating their territories and in the process of developing and implementing indigenous territorial management plans. This presentation aims at demonstrating the application of two indigenous territorial management models, the one with the Lecos Apolo People and the second with the Tacana People, both ethnic groups located in northern La Paz Department, Bolivia, within the framework of their cultural vision and responding to a process of organizational and regulatory strengthening, as well as the construction of a monitoring system and the generation of economic alternatives through the sustainable exploitation of their natural resources, and as a result, demonstrate that the achievements during the process have favored and impacted conservation, political incidence and local governance.

THE INFLUENCE OF HIDDEN COGNITIVE DIVERSITY ON THE PRODUCTIVITY OF CONSERVATION TEAMS

Phillip Levin, The Nature Conservancy

The complexity of conservation issues in concert with a greater degree of specialization has resulted in the growing use of working groups or other forms of teamwork to address pressing issues in natural resource management. Theory predicts that diversity in team composition will increase creativity and productivity of groups. However, the notion of a strong effect of diversity on scientific team performance is not backed by reliable and generalizable evidence. Moreover, diversity in conservation working groups is typically characterized by observable traits such as gender, ethnicity, nationality, or professional discipline, and the potential for a profound impact of cognitive diversity has not been examined. In this study, we investigated the impact of this hidden cognitive diversity on creativity, cooperation, conflict and adaptability of conservation teams. We first developed fuzzy-logic cognitive maps for all team members, using the Baltic Sea pelagic system as a case study. We then used variability in network traits of these mental models as the principle axis of diversity, and created teams of varying levels of diversity. We next performed an experiment in which teams participated in a cooperative, decision-making game, with the hypothesis that more diverse teams would exhibit higher creativity and conflict, but lower productivity than less diverse teams. Team members showed enormous cognitive diversity with mental models varying greatly in linkage number, density, centrality and node membership. Experimental results suggested that this diversity played an important, but complex role in team functioning, with impacts on both the magnitude and frequency of conflict as well as overall team success.

THE INFLUENCE OF VALUES AND LAND USE ON ATTITUDES TOWARD MANAGEMENT OF HUMAN-WILDLIFE CONFLICTS

Alia Dietsch, Ohio State University

Management of human-wildlife conflict (HWC) continues to be a pressing conservation challenge. For example, carnivores such as wolves (*Canis lupus*) and bears (*Ursus spp.*) are highly persecuted by people fearful of depredation, yet the same carnivores are celebrated by others as important regulators of ecosystem functioning. Gaining a greater understanding of what leads to these discordant viewpoints regarding wildlife involved in conflict can inform development of solutions and potentially lead to greater tolerance of offending animals. Thus, it is important to know what shapes people's thoughts about HWC. Research suggests that social values (or fundamental beliefs about the world around us) contribute significantly to attitudes toward management of wildlife, and this talk demonstrates the critical role that values play in shaping responses to species involved in conflict. Data collected from self-administered questionnaires in Washington state (n = 4,183), in combination with data collected by the U.S. Department of Agriculture, were analyzed using regression models that controlled for practices such as livestock rearing and crop production relative to the species under investigation (e.g., *Canis spp*., *Ursus americanus*, *Odocoileus spp*.). An example finding shows that the number of people at the county level who

are classified as having a value orientation prioritizing human use of wildlife accounts for 42% of the variation in support for compensating livestock owners for wolf-related depredation. Another 13% of variation could be explained above and beyond values by the percentage of livestock-related sales in that county. Findings suggest a complicated landscape in which values, land use practices, and ecology play significant roles in the types of conflicts that occur, which underscores the importance of interdisciplinary approaches to understanding drivers of HWC.

THE INTERNET OF EARTH THINGS

Shah Selbe, National Geographic Society

The Internet of Earth Things leverages the innovation seen in "smart devices," which are network connected physical objects with embedded microprocessors, sensors, and software, to benefit efforts in science and conservation. The work currently underway for IoT, by academics, corporations, and industry groups, in the creation of the connected home or "smart cities" has bigger implications that many realize. Additionally, the hardware created to support the smartphone industry (smaller/better processors, sensors, batteries, communications equipment) have created opportunities to miniaturize and spread IoT capabilities. These smaller components have already spawned massive online communities working on open source technology development, which largely created the current drone technology boom, desktop 3D printing, and more. There are many areas where current conservation and science efforts could benefit from these same improvements in hardware development, IoT-related protocols, and open source software/code. The Internet of Earth Things seeks to do just that... to create connected nature reserves instead of connected toasters and thermostats. By watching over the appropriate variables in an ecosystem, we can ensure that any impacts to biodiversity and ecosystem health are quickly identified and the appropriate mitigation efforts can be taken. If the systems are created with the appropriate sensors and deployment plans, we can start to identify changes in the environment years (or even decades) before our current capabilities. Alarms can be set on specific parameters and logic within the computer can determine risk levels and notify whoever needs to be notified. Additionally, the low cost and ease of build could help to open up new possibilities for scientific data collection and environmental protection (from poaching, overfishing, and resource exploitation) on a magnitude that was never possible.

THE IUCN RED LIST IN CONSERVATION ACTION: THE CONSERVATION VALUE OF SAVING THE SMALL

Thomas Lacher, Texas A&m University; Nicolette Roach, Texas A&M University

The IUCN Red List of Threatened Species is the most widely used data set in global biodiversity conservation conventions. It is used by both CITES and the Convention on Biological Diversity for setting policy and prioritizing conservation action; at least 10 of the 20 Aichi 2020 targets incorporate information derived from the Red List. An important expansion of the Red List process has been in the development of global assessments of all species within major taxonomic groups. The global assessments, especially those of amphibians and mammals, have given us a comprehensive view of threat allocation across taxa, and are reshaping the prioritization of conservation actions. Traditional approaches have focused on large, wide ranging species, but many of the most threatened species in these groups are small, locally distributed taxa. We argue that there is high conservation value in focusing conservation efforts on saving the small. From the perspective of community richness estimates, most species in ecological communities are rare, and a disproportionate number of these are small body size species that represent an extremely high diversity of functional traits responsible for maintaining many ecosystem processes. These small and rare species also exhibit strong habitat preferences and frequently have restricted ranges, especially along precipitation and elevational gradients. As a result, small species also represent high levels of endemism, especially at the country level scale. Because of the general pattern of restricted ranges, small taxa are sensitive to low levels of habitat alteration and relatively minor shifts in temperature and precipitation because of climate change. As a consequence, small species will figure strongly in country level action plans focused on extinction mitigation.

THE KBA IDENTIFICATION PROCESS AND KEY ACTORS

Zoltan Waliczky, BirdLife International; David Diaz, BirdLife; Penny Langhammer, Arizona State University

Following the adoption of the KBA Standard, the KBA Partnership was formed to develop and implement a global KBA Programme. The main goal of the Programme is to develop and maintain a fully documented and updated list of sites identified according to the Standard and to communicate and promote this list. Although more than 17,000 KBAs already exist in the form of IBAs, AZE sites and other denominations, it is expected that the KBA Standard will be applied to a wide range of biodiversity

elements by experts. The proposed KBA identification process has a number of stakeholders with different roles to play, from compiling data to identify sites that meet the KBA criteria to providing external review of KBA proposals to formal submission and final validation of a KBA. It is expected that most KBA proposals will be generated at the national level but international organizations with relevant data and expertise will also be able to propose sites as KBAs. The starting point of the exercise should be the list of already identified KBAs, wherever possible, and the process should be inclusive and highly participatory to secure buy-in from relevant stakeholders. There are various checks and reviews performed during this process to ensure that the Standard is correctly applied and the proper documentation to support the site nomination is compiled. The World Database of Key Biodiversity AreasTM will support every step of this process and serve as the final depositary of the authoritative list of KBAs. The KBA Community will provide a platform for collaboration and exchange between experts and organizations involved in KBA identification, review and monitoring.

THE LAND TENURE GAP AND ITS INFLUENCE ON SOCIO-ECOLOGICAL CONDITIONS

Yuta Masuda, The Nature Conservancy; Margaret Holland, University of Maryland, Baltimore County, UMBC; Allison Kelly, University of Washington

In this talk, we present research on the tenure gap, which is the incongruence (in both directions) between "on-the-ground" rules and rights used to manage land, and the land rights as seen in the eyes of the state. Our work characterizes and assesses the characteristics and impacts of tenure gaps in the places where they occur. Here we present insights from a survey across 10 countries that illustrates the characteristics and impacts of the tenure gap. This research builds from a framework linking land tenure security, conservation, and human well-being, which articulates how socioeconomic and environmental outcomes will be improved if existing pro-community and pro-poor laws and regulations related to tenure are upheld, enforced, and defended, and if socially-defined rights are recognized and formalized. We see the results from this study as offering critical information to conservation and development organizations about one of the major obstacles to strengthening and clarifying land tenure for local stakeholders.

THE LOCAL PERSPECTIVE: FOREST MANAGEMENT VIA INDIGENOUS VISIONS

Carlos Rodriguez, Tropenbos International Colombia

Indigenous communities have an elaborate vision of the forest and its management. For them, the world was molded and entrusted to the different groups from time immemorial for them to occupy and steward via their care and management over the long term. The designation and management of territory emerge from a series of ecological and cultural principles, which regulate the communities' relationship with nature. This presentation brings together the local visions of different Amazonian ethnic groups through a number of primordial principles: those related to ancestral territory (that is, the birthplace of each group or of their designated ancestral site), the concept of spiritual owners as guardians of the resources, the role of the maloca as a basic center of interaction with nature, and the place of the shaman as the negotiator or regulator of the use of resources and division of resources to each group to ensure a good life for all. These principles taken together, illustrate these groups' essential familiarity with the tropical forest and the balanced use of the forest. They are in direct dialogue with western concepts of biology and the practice of conservation, summarized by the slogan: "Get to know in order to manage, for management is conservation."

THE LONG AND WINDY ROAD TO ADAPTIVE MANAGEMENT OF THE LOWER RIO NEGRO MOSAIC BRAZILIAN AMAZON

Guillermo Estupio, Wildlife Conservation Society, Brazil Program; Karl Didier, Wildlife Conservation Society; Marisete Catapan, Independent Consultant; Carlos Durigan, Wildlife Conservation Society, Brazil Program

Since 2014, the Wildlife Conservation Society's Brazil Program has been encouraging adoption of Adaptive Management (AM) principles in the Lower Rio Negro Mosaic of protected areas, following standard project management phases (e.g., Conceptualize the Project, Plan Actions and Monitoring, Implement, Evaluate and Adapt, and Share). Our early attempts to encourage AM focused on training partners (the "education will change behavior" theory of change). More recently, we have incentivized adoption by providing funding for concrete, multi-partner projects, but tying funding to production of planning products, such as theories of change and monitoring plans (the "monetary incentive" theory of change). Neither of these strategies has been successful at establishing wide-spread adoption of AM, although some progress has been made. Barriers to adoption include planning fatigue, especially through exposure to many project management tools and inconsistent government requirements; associated frustration that implementation does not happen; staff turnover and poor institutional consistency; resistance to AM processes that

are perceived to be "biodiversity" focused; lack of "long-term funding" allowing completion of a project cycle; and lack of effective mechanisms to communicate monitoring data to decision-makers so that they can adapt projects. Our current strategy de-emphasizes the planning phase and focuses on implementing effectiveness monitoring, encouraging clear communication of monitoring results to decision-makers, and facilitating explicit "evaluation and adaptation" events. We strongly believe that adoption of AM will continue to be piece-meal if donor organization's do not (a) require and encourage projects to demonstrate good AM (especially evaluation/adaptation phases) and to use critical AM tools (e.g., results chains) in project proposals and reports and (b) provide sufficiently long-term funding to allow projects to complete the project cycle at least once.

THE NEW CODE: INCLUSIVE SAFE CONSERVATION SCIENCE THRIVES UNDER CODES OF CONDUCT

Edward Hind-Ozan, Sustainable Places Research Institute, Cardiff University; Travis Nielsen, Azurigen Management and Consulting Solutions Inc.

It is increasingly recognised that it is not enough to assume that science is accessible to all, free from harassment. The United States' National Science Foundation highlighted this recently by releasing a statement that inappropriate conduct at grantee institutions would not be tolerated, stating funding could be withdrawn on non-compliance. Unfortunately, such statements come at a time instances of harassment in research environments continue to be reported. These have been particularly prevalent at scientific conferences, often not covered by workplace harassment policies. We believe it is unacceptable for conferences to be spaces of reduced safety for researchers. If we cannot ensure delegates feel safe attending conferences regardless of their gender, gender identity, sexual orientation, race, religion, or any other factor, then we are contributing to building barriers to scientific careers. Threatened researchers will opt for safer careers. This a great personal loss to them, but also to science and society. Talented researchers will cease working on issues like biodiversity conservation as they withdraw from a field working toward that goal. In 2016, the Organizing Committee of the 4th International Marine Conservation Congress (IMCC4) resultantly acted to ensure that delegates safety was guarded. Following policy recommendations of the Society for Human Resources Management and others, we instituted a 'Code of Conduct' (CoC) that delegates were required to sign up to as a prerequisite for attendance. In conference feedback, 89% (n=74) rated the CoC positively, with 100% (n=82) saying they found IMCC4 to be a safe space. Also, 63% (n=84) identified the CoC as facilitating their increased involvement in conference discussions. IMCC4 thrived as an inclusive space, in part due to the CoC. Here, we detail the CoC and advocate for all science conferences to adopt a similar code.

THE NEW CONSERVATION CHALLENGE FOR CORAL REEFS

Ken Anthony, Australian Institute of Marine Science; Gabby Ahmadia, World Wildlife Fund

The outlook for coral reefs under climate change is global decline. Recent record temperatures and mass coral bleaching events indicate reefs will continue on this path of negative trajectory and reef conservation is not keeping pace with increasing threats. Here, we argue that a broadening of the intervention arsenal may help counteract such decline. While conventional conservation approaches (e.g., Marine Protected Areas) must continue, additional interventions are needed to build ecological resilience even under best-case climate change. Such interventions include assisted evolution/migration and other approaches to climate-harden coral species. Potential risks could be offset by rewards of sustained species that support fisheries, livelihood and local economies. To maximize benefits and minimize risks we propose a portfolio strategy that takes account of a range of context including the vulnerability and resilience of reefs, regional governance, existing management regimes and socio-economic setting. Rather than providing specific examples of interventions, we present a framework that helps the audience appreciate how the symposium's talks integrate and offer solutions under this common theme.

THE NEW GLOBAL KBA STANDARD

Penny Langhammer, Global Wildlife Conservation; Annabelle Cuttelod, IUCN; Stephen Woodley, Iucn - World Commission on Protected Areas

A Global Standard for the Identification of Key Biodiversity Areas' consolidates the criteria and methodology for identifying sites that contribute significantly to the global persistence of biodiversity. Responding to a Resolution passed by IUCN Members (WCC 3.013), the KBA Standard was developed through a four-year global consultation process led by the IUCN SSC-WCPA Joint Task Force on Biodiversity and Protected Areas with the input of hundreds of experts across sectors. The Standard builds on more than 30 years of experience in identifying important sites for different taxonomic, ecological or thematic subsets of biodiversity, including Important Bird and Biodiversity Areas (IBAs), Important Plant Areas and

Alliance for Zero Extinction sites. The criteria in the KBA Standard can be used to identify sites of global significance for threatened biodiversity, geographically restricted biodiversity, ecological integrity, biological processes and irreplaceability in terrestrial, inland water and marine environments. Quantitative thresholds underpin the criteria to ensure that KBA identification is objective, transparent and repeatable. The thresholds were informed and calibrated by complementarity-based analyses examining the relative irreplaceability of IBAs, the bird subset of KBAs. They were tested for the geographically restricted biodiversity criteria using multiple regional datasets of plant, invertebrate and vertebrate species in terrestrial, freshwater and marine environments. 'A Global Standard for the Identification of Key Biodiversity Areas' was adopted by IUCN Council last year and launched at the 2016 World Conservation Congress in Hawaii, alongside a new Partnership to support its implementation.

THE PURSUIT OF 'WIN-WIN' SUCCESS FOR FORESTS AND PEOPLE IN THE PERUVIAN AMAZON

Josie Chambers, University of Cambridge

After decades of pursuing joint 'win-win' benefits for local people and forests, success has proved elusive. Projects are often plagued by seemingly irreconcilable trade-offs and unintended consequences. Despite these issues, emerging global mechanisms such as REDD+ have placed local 'win-win' interventions at the center of simultaneously addressing global challenges such as biodiversity loss, climate change, and poverty alleviation. One such local setting – the landscape of San Martín, Peru – has seen the rapid expansion of 'win-win' projects since 2005, including livelihood support within enforced protected areas, community-based natural resource management initiatives, and incentive-based schemes such as Payments for Ecosystem Services and 'sustainable' intensification. This talk focuses on 15 of these 'win-win' projects and explores the highly political process by which 'win-win' project ideas translate into on-the-ground results, and emerge as narratives of 'success' or 'failure'. The fieldwork involved interviews with coordinators of the 15 projects about their perception of their work and its results, as well as full-day ethnographic interviews with 270 households living in the project areas about their farm management, food security, wellbeing, and interaction with conservation projects. The findings highlight a number of problematic assumptions frequently made by 'win-win' project theories of change – both across this landscape and globally – regarding the causes of deforestation and human ill-being. In addition, several common practices by which interveners' design, implement and monitor 'improvements' are contributing to a mismatch between project rhetoric and local realities. It is critical to make these political processes more transparent in order to foster an improved link between reported outcomes and local perceptions.

THE RED LIST OF ECOSYSTEMS FOR COLOMBIA AND THE CONSERVATION OF BIODIVERSITY

Andres Etter, Pontificia Universidad Javeriana; Paula Amaya, Pontificia Universidad Javeriana; Angela Andrade, Conservation International- Colombia; Paulo Arévalo, Pontificia Universidad Javeriana

Colombia is a global hotspot of biodiversity, both at species and ecosystem levels, and is facing ongoing threats from land use and in the future from climate change. To address this problem, we used the new global standard for risk assessment of worldwide ecosystems of the IUCN Red List of Ecosystems (LRE), which aims at evaluating the risk of collapse of ecosystems, providing a new and complementary insight to biodiversity conservation. To apply this framework, we constructed a potential terrestrial ecosystems map, as a set of multi-temporal landscape transformation maps for the last 50 years and for 2040, and spatial models of historical and future environmental degradation, for water availability and seed dispersal changes. We identified and evaluated 81 types of terrestrial ecosystems for Colombia, of which 18 (22%) are in critical condition (CR), 17 (20%) categorised as endangered (EN) and 17 (20) categorised as vulnerable (VU), while 37% of ecosystems were evaluated as least concern (LC). The evaluation criteria A1 and A3 which address historical and recent decline in their geographical areas, ranked highest in the categorization of the threat to ecosystems. The main cause being the ongoing transformation of ecosystems due to the expansion of the agricultural frontier. Among the most threatened ecosystems are the enclaves of dry forests/scrubs and wetland ecosystems of the Andean region, and the tropical dry forests of the Caribbean region. Combining these results with Protected Areas maps, we found that 25 ecosystems are not included in the system. Of these, 6 correspond CR ecosystems, of which an additional 4 have less than 5% protection. Also 9 or 50% of EN ecosystems are not conserved in any way. Our results give important additional and complementary spatial multitemporal information for conservation planning.

THE ROAD TO ULTRA-AFFORDABLE TAGGING; WHY SYSTEMATICALLY OPEN SOURCING KEY TECHNOLOGIES OFFERS VALUE

Alasdair Davies, Zoological Society of London

Developing technical conservation technologies to solve conservation challenges often requires a number of specialists, tools and experience - electrical engineers, telemetry experts, injection moulders – each at a cost. This investment in both human and physical resources needs to be recouped, and so naturally, bespoke end products are often expensive, or are released under commercial licences that limit access to only those with the necessary funds to acquire, operate and maintain the product in the field indefinitely. There's a simple, yet profoundly important problem to address - we can't make informed conservation decisions if we don't have access to reliable, scientific knowledge and data. Access to affordable conservation technology is fundamentally important if we are to acquire that knowledge, and I see a world where open is fundamentally important if we are to enable that access. The advent of open fabrication facilities and open hardware platforms is starting to break through traditional barriers to entry, yet certain important tagging and tracking technologies continue to remain closed source, accessible to the few rather than the many. In this talk I focus on describing the objectives of the recently established Arribada Initiative, a collective of conservation technologists and specialists working to understand which technologies offer the most value and will have the greatest impact in the field if made open, affordable and accessible for all. As a case study I will describe the success of the initiative in funding and developing the open green sea turtle "pit stop" tag, designed to reduce the cost of acquiring spatial GPS and accelerometer data from nesting females by 90%. Additionally, I will document the technologies the initiative plan to focus on next and invite the audience to participate further through the WILDLABS.net community forums and the SCB Conservation Technology Working Group as a staging ground for future discussion.

THE ROLE OF MESSAGE FRAMING IN DELIVERING EFFECTIVE THREATENED SPECIES CONSERVATION PROGRAMS

Sarah Bekessy, GPO; Georgia Garrard, RMIT University; Alex Kusmanoff, RMIT University

The way in which a message is framed can have a significant influence on the interpretation and effectiveness of conservation messages. For example, messages that are framed in a negative light have been shown to be less effective at inspiring action than positively framed messages. Furthermore, responses to conservation interventions can be influenced by subtle wording changes in statements relating to concepts such as those which reflect their own values, for example about property rights. However, much remains unknown about the way in which framing affects social attitudes towards conservation of threatened species. Our project aims to understand how message framing influences public attitudes towards threatened species conservation and using this to develop effective communication strategies. We tackle this problem experimentally at two scales (1) at a broad scale, analysing public perceptions of key concepts (species triage, ecosystem services, biodiversity offsetting); and (2) at a fine scale, analysing messaging required to improve the success of specific threatened species programs. The fine scale analysis is based around case studies of species of interest to the Australian Government, testing framing effects for multiple stakeholders across a spectrum of engagement with biodiversity. Case studies include testing messages for 'non-charismatic' threatened species (priority threatened plant species) and to improve conflict situations (controlling feral species). Preliminary findings indicate that framing the benefits of threatened species in terms of ecosystem services may crowd out intrinsic motivations for conserving species. At the fine scale, we show the potential of closing the psychological distance to threatened species to increase the perceived importance of threats and the likelihood that people will act on those threats. This research highlights the role of message framing in the design and implementation of conservation programs.

THE ROLE OF PROPERTY RIGHTS PROPERTY RIGHTS IN RESISTING FOREST LOSS IN THE YUCATAN PENINSULA

Daniela Miteva, The Ohio State University; Edward Ellis, Centro de Investigaciones Tropicales, Universidad Veracruzana; Peter Ellis, The Nature Conservancy; Bronson Griscom, The Nature Conservancy

Many studies have investigated the challenge of achieving conservation in areas with high biodiversity and high threats of conversion and development. However, very little is known about the overall effectiveness of conservation interventions like protected areas and the local conditions that impact their performance on the ground. In parallel, even though community forest tenure has often been considered an effective means to resist forest loss in the absence of conservation interventions, empirical justification based on large-scale data and rigorous statistical techniques is still scarce. In this paper we use spatially explicit data and quasi-experimental methods to assess the role of tenure regimes (formal protected areas, community tenure in ejidos, and private property) in reducing forest loss in a biodiversity hotspot: the Yucatan peninsula in Mexico. Controlling for differences in the location of different tenure regimes as well as the threats of forest loss, we examine what tenure

regimes were effective in preventing forest loss between 2000 and 2014 in the three main forest types that vary in their commercial and biodiversity values. We find evidence that community tenure lowers the probability of forest loss relative to privately owned forests in the presence of protection, especially for forests with large commercial timber value. On average, we do not find evidence that community tenure alone reduces the probability of forest loss in the absence of protected areas or other conservation interventions at the scale of the Yucatan Peninsula. Thus, complementary conservation strategies (such as sustainable forest management certification or programs that encourage vertical integration within ejidos) are likely needed to improve community-driven resistance to forest loss.

THE ROLE OF THE NATURAL RESERVES OF CIVIL SOCIETY IN THE GOVERNANCE MEANS IN CONSERVATION

Angela Marcela Santamaria, Resnatur

The Colombian Network of Civil Society Nature Reserves (Resnatur) is a non-profit civil association that since 1991 has brought together owners who voluntarily decide to manage their rural land according to practices regarding biodiversity conservation and sustainable production. The common mission of these nature reserves is to contribute to the consolidation and positioning of private conservation initiatives for the construction of alternative social fabric, models of living, and development. It brings together type C and D governance initiatives (private and of local communities). Resnatur works mainly on a) Restoration processes in nature reserves, b) Community and member knowledge about strategies for conservation- sustainable production, and c.) Promoting tools for participation in environmental issues by Resnatur members and community. Colombia recognizes private reserves as areas protected by law, via conducted by the environmental authority, in this case the Natural National Parks office. Resnatur includes both registered reserves and others that do not need a registration in order to be recognized as conservation strategies or have land tenure issues. The latter may be considered Complementary Conservation Strategies, or as criteria become clear, Other Area Based Conservation Measures.

THE SPATIAL PATTERN OF REDWOOD BURL POACHING INCIDENTS: IMPLICATIONS FOR PREVENTION

Stephen Pires, Florida International University; Justin Kurland, Rutgers University; Nerea Marteache, California State University - San Bernardino

Poaching redwood tree burls is a serious problem for the Redwood State and National Parks (RSNP). Poachers remove burls by chainsaw and sell them for considerable profit. As a consequence, targeted trees are susceptible to disease and can ultimately perish. Further, should the tree die without its' burls it has less chance to reproduce as burls have the capacity to grow into new redwoods. Given the small number of state (N=4) and federal (N=8) rangers and other limited resources the RSNP have at their disposal, the problem may persist unless preventive interventions are adopted. Within the RSNP, it may be that certain areas are more vulnerable as a result of their proximity to roads, trails, access points, burl shops, and away from camps sites. To better understand this problem, the current study first explores the spatial distribution of poaching incidents in the RSNP before employing a spatial econometric approach driven by two criminological theories—crime pattern and routine activity theory — to understand what features of the environment within the RSNP might best explain the poaching problem. Policy implications are discussed as to how best to prevent such incidents in the future.

THE STATE OF INTERDISCIPLINARITY IN MARINE CONSERVATION SCIENCE: A MULTI-METHOD REVIEW

Clare Fieseler, UNC Chapel Hill; Steven Alexander, National Socio-Environmental Synthesis Center; Stockholm Resilience Center; Holly Niner, UCL; David Shiffman, Simon Fraser University; Lindsey Williams, University of New Hampshire

Interdisciplinary research is increasingly recognized as important for addressing today's most pressing marine conservation issues. Of the seventy-one important research questions for marine biological conservation identified in a recent Conservation Biology paper (Parsons et al. 2014), only thirty-two could be addressed comprehensively with methodologies and theories from the natural sciences alone. The remaining forty-two require integration of methods and theories from the social sciences. Yet despite the call for greater interdisciplinary research, the extent to which this trend has been actualized in marine conservation research and interventions is unknown. A mixed-method review of the peer-reviewed literature was conducted to answer the following questions: (1) What is the state of interdisciplinarity within marine conservation interventions and applied research? (2) Do interdisciplinary research projects conceptualize pathways for impact? (3) Do interdisciplinary interventions reach desired outcomes? To analyze the peer-reviewed literature, we use topic modeling (i.e., latent Dirichlet allocation), a statistical method for investigating patterns and trends in large

collections complemented by in-depth qualitative text analysis. Sub-setting this broad corpus of marine science and conservation practice, a qualitative review examines the integration of social and natural science domains. The review codes variables related to policy-relevant impact (stakeholder engagement, research-generated knowledge pathways, problem framing, intervention outcomes) and relates those to interdisciplinary variables. Results present a landscape-level perspective of interdisciplinarity over the last 30 years of marine conservation. It then relates interdisciplinary metrics with the characteristics of policy-relevant recommendations and real-world outcomes.

THE STATE OF THE U.S. ENDANGERED SPECIES ACT UNDER A TRUMP ADMINISTRATION

Noah Greenwald, Center for Biological Diversity

The election of Donald Trump as the United States President along with continued control of Congress by Republicans presents an unprecedented threat to the U.S. Endangered Species Act. This threat applies not just to U.S. endangered species, but also to species across the world because the Act is the primary means by which the U.S. implements international wildlife treaties. Since Republicans took the House of Representatives in January 2011, they have launched more than 230 legislative attacks on endangered species, few of which passed under the Obama administration. With the recent election, there is an increased likelihood that legislation weakening protections for particular endangered species or the law itself will pass. The election will also likely impact implementation of the Endangered Species Act, which is carried out by the executive branch with funding determined by the House of Representatives. The Obama administration improved some aspects of implementation of the Act, most notably improving the rate of listing of species as threatened or endangered, leading to reduction in a backlog of species waiting for protection. There are strong indications that such gains will be reversed under the Trump administration either because of cuts in funding or appointment of officials in the Department of Interior and U.S. Fish and Wildlife Service hostile to protection of endangered species. We discuss these threats to species conservation with analysis and examples of legislation, executive orders, administrative rules and the record of political appointees.

THE STATUS QUO OF SYSTEMATIC CONSERVATION PRIORITISATION: A GLOBAL SURVEY

Sam Lloyd, Imperial; Andrew Knight, Imperial College London; Emma McIntosh, Oxford University; E.J. Milner-Gulland, University of Oxford; Hugh Possingham, The University of Queensland; Bob Smith, DICE, University of Kent;

Systematic conservation planning has become an increasingly ubiquitous tool over the last three decades. Its adaptability and potential for using a breadth of data to tackle an equally wide scope of issues has led to its uptake by conservation practitioners and academics alike across the globe. As a result of this widespread use however, it is difficult to see the larger picture and it is therefore unclear what the status quo of this broadly applied field is. The research presented fills this gap through a global review of conservation plans from both the peer reviewed and grey literature. Through a combination of an extensive literature review and a snowballing approach the experiences of planners were collated through an online survey. This research examines how conservation plans are created, whether they are able to translate from theory to practice and what challenges are faced in the process. Examining plans across the globe from all realms, this in-depth review has provided a clear description of the state of the art of systematic conservation planning, the challenges faced, and the potential directions in which the field is heading.

THE SUFFICIENCY AND SUITABILITY OF GLOBAL BIODIVERSITY INDICATORS TO MONITOR BIODIVERSITY CHANGE

Derek Tittensor, UNEP-WCMC; Chris Mcowen, UNEP-WCMC; Anna Chenery, UNEP-WCMC; Matthew Dixon, Environmental Change Institute, Oxford University; Sarah Ivory, UNEP-WCMC; Andreas Obrecht, Federal Office for the Environment, Bern; Eugenie Regan, The Biodiversity Consultancy; Anne Teller, European Commission—DG Environment

Biodiversity indicators are widely used tools to help understand biodiversity change and the success or failure of efforts to conserve it. Nevertheless, despite significant global efforts in biodiversity indicator development, indicators in a number of key areas are still lacking, or when they are present, their sufficiency and suitability in providing information for decision-makers varies. In this talk I present the results of a gap analysis of the indicators brought together under the Biodiversity Indicator Partnership. The indicator suite was assessed to identify four types of gaps: 1) where Aichi Biodiversity Targets have no indicators, 2) where indicators are present but their alignment to the text of the Aichi Target is poor; 3) where indicators are present but their temporal relevance to the CBD's Strategic Plan is low and/or 4) where indicators are present but their spatial coverage is limited. The coverage of Aichi Biodiversity Targets across the indicator suite was found to be good, with all but three of the 20 Targets having indicators. Yet, when assessed in

relation to their alignment, temporal relevance and spatial scale an additional 6 gaps were identified. Gaps were predominately found to be socio-economic in nature (i.e., benefits, pressures, and responses) rather than status-related (i.e., states), principally due to a poor alignment between the indicator and the text of the Aichi Target. At the end of the talk I present steps currently being taken by the Biodiversity Indicators Partnership (BIP) to fill some of these gaps as well as attempts to harmonise and strengthen the use of biodiversity-related information and indicators, not only in relation to the CBD's Strategic plan but also across other biodiversity-related conventions and intergovernmental processes such as the SDGs and IPBES.

THE URBAN WILDLIFE INFORMATION NETWORK: AN INTEGRATED APPROACH TO URBAN WILDLIFE RESEARCH

Seth Magle, Lincoln Park Zoo; Mason Fidino, Urban Wildlife Institute; Liza Lehrer, Lincoln Park Zoo

Most people don't study ecology because of a deep-seated love of vacant lots and highway embankments. However, urban areas are the world's fastest growing ecosystems, and a surprising diversity of wildlife is making a home in the margins of cities both large and small. Lincoln Park Zoo's Urban Wildlife Institute has been conducting urban wildlife research in the greater Chicago area since 2009, including studies of mesocarnivores, bats, arthropods, and on human dimensions of wildlife. We have developed a robust, generalizable approach to wildlife monitoring that uses multiple approaches in tandem (e.g., motion-triggered cameras, ultrasonic bat monitors) along urban-to-rural gradients in multiple seasons across numerous years. We will briefly describe the results of some studies from this research, and will also introduce the Urban Wildlife Information Network, a nation-wide effort to synchronize studies of wildlife species in cities by using the monitoring approaches developed in Chicago. This network now includes partners in Kansas, Colorado, Indiana, and Wisconsin, and will continue to expand in the years to come. We contend that only by expanding urban wildlife research beyond our individual study areas and making broad-scale comparisons between cities can we differentiate local patterns in urban wildlife from universal ones. In so doing, we can for the first time generate global-scale recommendations for conservation and management of urban species.

THE URGENT NEED OF A COMPREHENSIVE PLANT RISK ASSESSMENT IN MEXICO

Esther Quintero, CONABIO; Angelica Cervantes, Conabio; Rafael S. Ramírez, CONABIO; Franz Mora, CONABIO

Mexico, as one of the megadiverse countries of the world, possesses the fourth richest flora. The most recent inventory of the native vascular plants published in 2016 yielded 23,314 species, 50% or which are endemics. Although there have been important efforts to improve our understanding of the Mexican flora, we are far behind in assessing its risk status. In Mexico the national Red List, NOM-059-SEMARNAT-2010, includes 2606 species of flora, 987 corresponding to plants including algae, bryophytes, pteridophytes, gymnosperms and angiosperms. Of these, only 93 were assessed in order to being listed, through the Evaluation Risk Method (MER), introduced in 2001. These numbers are a stark contrast to those from other megadiverse countries such as Brazil, Colombia, and South Africa which have developed sound methodologies for performing national assessments. It is imperative to conduct a comprehensive national assessment of the Mexican flora in order to prioritize conservation efforts and promote actions towards the sustainable use of the resources and its fair and equitable sharing. Moreover, such an assessment would be the first step towards achieving Aichi Biodiversity target 12, derived from the CBD, which establishes that "by 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained". We are certain that through active collaboration with scientists of other megadiverse countries which have accomplished national evaluations, we will be able to conduct our national red list plant assessment in a reasonable time, an objective that until now seemed difficult to reach.

THE USE OF CONSERVATION DRONES TO IMPROVE PROTECTED AREA MANAGEMENT

Barbara Bollard Breen, Auckland University of Technology; Ashray Doshi, Auckland University of Technology; Neil Gilbert, Constantia Consulting; Rebecca Jarvis, Institute for Applied Ecology New Zealand, Auckland University of Technology

Traditional field based methods of habitat mapping to determine and classify vegetation have been unsuccessful in terms of extensive coverage, time and cost-effectiveness. Remote sensing using Unmanned Aerial Vehicles (UAV) is a relatively newly technology which has the capability to acquire land, resources and environmental gradients as well as other remotely sensed information quickly, automatically and intelligently to complete data processing, modelling and application analysis. Conservation outcomes in the remote and vulnerable locations such as Antarctica are limited by resources for monitoring past and cumulative effects of

human impacts on vulnerable ecosystems. Using UAVs and other technologies we have developed novel "zero-harm' remote survey tools for conservation solutions. The low altitude remote sensing project we conducted at three Antarctic Specially Protected Areas (ASPAs) provided high resolution spatial maps of vulnerable habitats obtained from unmanned aerial vehicles (UAV) and spatial analysis software developed specifically for use in Antarctic environments. This case study demonstrates how new conservation technologies, such as UAVs, can be used to map biodiversity and monitor human impact to improve protected area management. Traditional field-based methods of habitat mapping to determine and classify vegetation have been unsuccessful in terms of extensive coverage, time and cost-effectiveness. Remote sensing using Unmanned Aerial Vehicles (UAV) is a relatively newly technology which has the capability to acquire land, resources and environmental gradients as well as other remotely sensed information quickly, automatically and intelligently to complete data processing, modelling and application analysis. Conservation outcomes in the remote and vulnerable locations such as Antarctica are limited by resources for monitoring past and cumulative effects of human impacts on vulnerable ecosystems. Using UAVs and other technologies we have developed novel "zero-harm' remote survey tools for conservation solutions. The low altitude remote sensing project we conducted at three Antarctic Specially Protected Areas (ASPAs) provided high resolution spatial maps of vulnerable habitats obtained from unmanned aerial vehicles (UAV) and spatial analysis software developed specifically for use in Antarctic environments. This case study demonstrates how new conservation technologies, such as UAVs, can be used to map biodiversity and monitor human impact to improve protected area management.

THEORY OF CHANGE AS A FRAMEWORK FOR SHARING LEARNING BETWEEN PROTECTED AREAS

Guillermo Placci, Foundations of Success; Arlyne Johnson, Foundations of Success; Nick Salafsky, Foundations of Success; Armando Valdes-Velasquez, Foundations of Success/Cayetano Heredia University

Although conservationists agree that evaluating the effectiveness of protected area management is important, a common understanding is still lacking on how to design and structure monitoring to evaluate effectiveness in order to systematically learn and improve protected area management. Conservation strategies, such as law enforcement, environmental education, sustainable tourism and promoting alternative livelihoods are just a few examples of the many interventions that are frequently implemented in a wide range of protected areas in various contexts and scales. In some cases, these strategies have proven effective in achieving conservation results. In other cases, the same strategy has failed to deliver conservation outcomes, or even worse, has contributed to negative impacts on biodiversity. Although many protected areas are implementing similar strategies, there is little systematic evidence to determine to what extent and under what conditions a given strategy is effective in achieving conservation results. Protected areas networks have a unique opportunity to systematically answer this question. In our presentation, we illustrate how simple tools like common result chains can explicitly depict how a conservation strategy is expected to generate conservation results. Using these common result chains, protected areas can select a shared set of indicators for monitoring that will not only help to identify if a strategy is effective or not at the level of each protected area but will also facilitate comparison of results across the entire protected area system that will significantly contribute to conservation learning.

TIME FOR TRIAGE WHICH CORAL REEF CONSERVATION OBJECTIVES DO WE PRIORITIZE

Stephanie Wear, The Nature Conservancy

It is time to face reality. Climate change is happening and we cannot save every coral reef across the tropics from its effects. Decisions are already being made about which reefs need urgent attention and which are less likely to get any help. Some of these decisions are carefully considered and some happen by default for a variety of reasons. But more tough decisions are necessary. For those reefs receiving management attention, what services do we want them to provide and which of those services do we value most? Different management strategies will often enhance some services over others (e.g., shoreline protection vs biodiversity) and we cannot maximize all services at once. We must be prepared to make these decisions. The complexity of these decisions goes well beyond choosing between people and nature. This talk highlights the range of services and values sought in reef management and the trade-offs likely to occur in prioritization. It will also identify how some conservation objectives are likely to be positively correlated and may provide a greater return on investment. Finally, the unintended consequences or negative impacts of prioritizing one conservation objective over another is something that should be fully considered in the process. Being intentional about these decisions is critical for reefs to have a chance at persisting at even a minimal level of

functionality, with the obvious goal being thriving reefs that continue to provide a high level of services.

TOOLS TO PROTECT AND PROMOTE ECOSYSTEM SERVICES WITHIN CERTIFIED FOREST MANAGEMENT: PILOTS FROM PERU

Yadid Ordoñez, FSC

Responsible forest management certification is extending its scope to Ecosystem Services (ESs), developing tools to ensure that forests and their ESs are managed responsibly; demonstrating the impact of certification for ES maintenance to companies, investors and governments; generating an opportunity to access emerging markets for ES payment. Besides, the expansion of certification to the ESs market will help to achieve biodiversity conservation and additional benefits for small producers and communities; reduced deforestation and degradation in the region towards ecosystems' sustainable use and conservation. This tool has been included in a specific annex of the certification standard (Annex C), which allows the forest manager to expand its certification to include several ESs such as carbon, conservation of biological diversity, watershed services, and soil conservation in the forest. The tools are being implemented and tested in two pilot sites certified for more than 5 years in the Peruvian Amazon: (1) Native Community Belgica. An area of 53,000 hectares of tropical forest. Its responsible forest management includes biodiversity, maintenance of community basic needs (water) and are essential to the traditional cultural identity. (2) Consolidado Otorongo. An area of 73,000 hectares of tropical forest under the Peruvian concession scheme, with a high concentration of biological diversity, including threatened and endangered species, the area is a critical habitat for Jaguar. At the sites, a thorough methodology for identifying threats, management and monitoring activities for key environmental services will be developed in addition to strategies and measures to protect, maintain and monitor such services. The methodology proposes the development of impact indicators associated to a financial mechanism to value these impacts. These methodologies will be complemented with a commercial strategy to communicate the impact to the market.

TOWARDS A GLOBAL TYPOLOGICAL FRAMEWORK TO SUPPORT RED LISTING OF ECOSYSTEMS

David Keith, Centre for Ecosystem Science, University of NSW

Red lists identify biodiversity that is at greatest risk of loss. Species are convenient units of assessment defined by an accepted taxonomy, albeit uncertain, subject to ongoing revision and based on several different species concepts. A similar taxonomy does not exist for higher levels of biodiversity, yet there is a need to assess risks at multiple levels of biological organisation. Assemblages of species and their associated environments, known variously as ecosystem types, ecological communities and habitat types have become useful conservation planning tools and regulatory instruments in jurisdictions across 4 continents, where Red List assessments have already been carried out. The typologies underpinning these assessments have invariably been developed independently, limiting the scope for comparison, integration and global assessment. In this paper I outline collaborative work towards a global typological framework to support risk assessment of ecosystems. Key requirements of such a framework include: i) applicability across terrestrial, subterranean, freshwater and marine ecosystems; ii) a high-level structure that defines relationships 'horizontally' across themes and regions, and vertically' across multiple scales of organisation; and iii) flexibility to accommodate local data and expert input into the definition of operational units. Existing regionalisations such as Global Ecoregions are potentially important biogeographic components that represent species pools within the framework . However, the framework also needs to incorporate ecological processes (selection filters) that underpin ecosystem organisation and which are crucial in sustaining their biota. Examples from Community assembly theory thus provides a useful foundation for integrating compositional and process components of an ecosystem typology. I illustrate the above issues with examples from existing national typologies that we aim to integrate in a global Red List of Ecosystems.

TOWARDS AN EARTH SYSTEM DATA CUBE FOR COLOMBIA: CURRENT STATUS AND POTENTIAL

Lina Estupiñán, Instituto de Investigación de Recursos Biológicos Alexander von Humboldt; Miguel Mahecha, Max Planck Institute for Biogeochemistry; Fabian Gans, Max Planck Institute for Biogeochemistry; Victor Gutierrez-Velez, Temple University; Maria-Cecilia Londoño, Instituto de Investigación de Recursos Biológicos Alexander von Humboldt; German Poveda, National University of Colombia, Medellin; Björn Reu, Universidad Industrial de Santander; Carlos Sierra, Max Planck Institute for Biogeochemistry; EOS for Colombia Team, Multiple

In the expectation of a peaceful future, Colombia may face massive land-use changes. These socioeconomic transformations need to be monitored comprehensively in order to facilitate science to understand the ecological consequences and inform policy-making. However,

understanding ecosystem functioning in rapidly transforming landscapes typically requires analyzing a multitude of interacting variables that are available in different formats and at different resolutions. Quantifying land-surface processes, climate dynamics, and land-atmosphere interactions, all require a plethora of observational data streams that need to be co-interpreted. We consider that "Earth System Data Cubes" could become powerful tools for a wide range of researchers in this context. Theses cubes effectively concatenate a multitude of data products covering e.g., climate observations, land surface processes, and land-atmosphere interactions. The aim is to minimize the barriers to a wide audience of scientists in accessing data streams for enhanced spatiotemporal analyses. Building on the existing http://earthsystemdtacube.net, we currently develop a suitable and useful harmonized "Earth System Data Cube" (ESDC) for Colombia. The regional cube is accompanied by a "Data Analytics Toolkit" that provides high-level functions to facilitate access and to effectively explore the Earth system Data Cube. Our aim is to support regional initiatives, such as the "Ecological Observatory for Colombia" and "Bon in a Box" Colombia (https://boninabox.geobon.org). The expected regional (high-resolution) data cube for Colombia should become an easy-to-use interface for conservation ecologists and many other related researchers, for instance it is essential to take special consideration of the unique characteristics of Colombia as an "Amphibian Country", i.e., countries where land surface dynamics that cannot be understood either as water or land processes but that require accurate assess.

TRACKING THE USE OF WILD ANIMALS: A GLOBAL DATABASE OF WILD ANIMAL OFFTAKE CONSUMPTION

Lauren Coad, University of Sussex

The harvest of wild animals from land and sea is valued at more than US$400 billion annually, and is a major source of protein and income for more than a billion of Earth's poorest inhabitants. Simultaneously, the unsustainable harvest of wild animals is one of the major threats to terrestrial biodiversity. However, while comprehensive global information on the harvest of wild fisheries now exists, global information on the harvest and use of wild animals on land has lagged. Accurate global information on wild animal harvest and use is needed for reporting towards multiple international conventions and targets, and regional and national data on wildlife offtake and use are needed to inform national wildlife and food security policies. Recognizing these needs, the CBD has explicitly called for the development of 'appropriate monitoring systems of bushmeat harvest and trade' (Decision XI/25, CBD 2012). While considerable data on wildlife harvest and use exists at the case-study/site level, taken individually these studies can tell us little of national and regional drivers of and trends in wild animal harvest and use. The OFFTAKE database has been developed to collate site-level information in a standardized format, providing much-needed national and regional perspectives. In this presentation, we introduce the database and demonstrate its function, including the creation of regional indicators of wild animal use, the estimation of offtake levels and identifying hunting 'hotspots', and the investigation of the drivers of wild meat hunting and consumption. We discuss the use of the database in terms of conservation policy at national, regional and global scales and how OFFTAKE data can be used to inform conservation interventions at national and local scales.

TRADEOFFS AND SYNERGIES IN MPA IMPACT FOR SOCIAL AND ECOLOGICAL OBJECTIVES

Megan Barnes, University of Hawaii at Manoa; Gabriella Ahmadia, World Wildlife Fund; Helen Fox, National Geographic Society; Louise Glew, World Wildlife Fund-US; Michael Mascia, Conservation International; Fitry Pakading; Purwanto

Marine conservation strategies often allocate considerable resources towards the establishment and management of Marine Protected Areas (MPAs) with the expectation they will both provide sustainable fisheries that support community livelihoods and wellbeing (including food security), as well as biodiversity benefits for coral reef ecosystems. This rigorous, interdisciplinary study tests the common rhetoric that increases in ecosystem benefits lead to increases in social benefits. We investigate both the ecological and social impacts of MPAs, and examine short-term synergies and tradeoffs that have occurred among objectives. We applied a quasi-experimental design to control for observable bias in MPA placement and outcomes to disentangle MPA impacts from broader social-ecological trends in human well-being and coral reef conditions in Eastern Indonesia. Baseline and repeat data was collected at six MPAs at over 150 coral reef monitoring sites, and 112 settlements within and outside of MPAs. Ecological and social MPA impacts vary across indicators and in both magnitude and direction of impact. We apply a decision-theoretic framework to examine the synergies and tradeoffs among and between the ecological and social MPA impacts, finding evidence for trade-offs and synergies between MPA social and ecological objectives, which vary at different spatial scales. These insights will inform ongoing adaptive management and marine spatial planning and policy, as well as advance

our understanding of the dynamics of complex social ecological systems.

TRANSBOUNDARY CONNECTIVITY INITIATIVE IN A MOSAIC OF LANDSCAPES SHAPED BY HUMANS

Ancuta Cotovelia, INCDS Marin Dracea, Transilvania University

Europe is characterized by a fragmented natural landscape, interspersed with high human population densities; protected areas with natural habitats are small and spatially disconnected. However, in this human-dominated landscape matrix, conservation and management efforts needs to be expanded into large landscape scale, also considering the new IUCN designation of Areas of Connectivity Conservation (ACC – currently under review). For achieving this, coordination with stakeholders across Europe, in order to combine different data types and analyses, to evaluate patterns of functional connectivity and landscape effects on species gene flow, determining the structure of food web interactions and the economic value of the key ecosystem services, will be implemented. Combining this with modeling approaches in order to predict future changes in range dynamics and food resources and applying quantitative model comparisons to evaluate existing ecological networks (using multi-species simulations), will point out if the networks are suitable for conserving biodiversity and ecosystems functions. Our work explores: assessing the effectiveness (functional connectivity) of the existing system of ecological networks for supporting the resilience of brown bear populations and associated ecosystem services in Europe, elaborating adaptive management measures and advocating for policies, plans and strategies that champion large landscape conservation, by sharing values among stakeholders, directing our scientific inquiry towards solving common problems.

TRANSLOCATION SUCCESS FOR DIBBLERS PARANTECHINUS APICALIS IS EXPLAINED BY INVERTEBRATE ABUNDANCE

James Friend, Dept. Parks and Wildlife; Carole Lerch, Ecole Nationale Vétérinaire de Toulouse

Translocation is an important strategy in reducing extinction risk for threatened species that have been reduced to a small number of populations. Often, however, it is difficult to decide on suitable translocation sites within the former range of the species and decisions are often made on the basis of similarity of vegetation to known sites. The dibbler is a 40-120g Australian dasyurid marsupial with a high dietary dependence on surface-active invertebrates. Its distribution declined greatly in the last 200 years largely due to predation by introduced foxes and cats. Although some small populations remain on offshore island, the stronghold of the species is the 2,972 km² Fitzgerald River National Park (FRNP) on the south coast of Western Australia. Since 2000, three attempts have been made using captive bred animals of FRNP stock to establish new mainland populations in sites where vegetation resembled that at dibbler sites in FRNP and where cats and foxes are controlled. Only one has been successful. This study examined litter invertebrate abundance at all sites as a possible determining factor in translocation success. In order to compare invertebrate abundance between the four sites, samples of leaf litter on the ground surface at 10 randomly selected points at each dibbler site were collected. All surface litter within a 0.25 m2 plot was collected and transported directly to the laboratory, where invertebrates were extracted using Berlese-Tullgren funnels. Invertebrates were sorted to Order and individuals over 2mm in body length were counted. The abundance of invertebrates over 2mm in length increased progressively from Stirling Range (failed site) to Waychinicup (failed) to Peniup (successful) to FRNP (source). Abundance at each of the failed translocation sites was significantly different to the source site. It is recommended that measurement of invertebrate abundance become an essential element of site assessment for future dibbler translocations.

TREE DIVERSITY PATTERNS AND REGIONAL CONSERVATION PRIORITIES IN CENTRAL AMERICAN-NORTHERN SOUTH AMERICAN DRY FORESTS

Karina Banda R, Royal Botanic Garden Edinburgh, Fundacion ESC

Tropical dry forest has been considered one the most threatened tropical forests worldwide. Conservation efforts have been insufficient, for example in Colombia the remaining dry forest covers only 8 % of its original extent. This study aims to identify floristic affinities and diversity patterns of Central American and northern South American seasonally dry tropical forests and to frame their conservation prioritization in a regional context. Classification methods were used to analyze 113 areas in this region from the DRYFLOR database that include 1725 species of trees, finding ten floristic groups. Prioritization of conservation actions usually requires a huge amount of detailed information that is not available for tropical species. So it is necessary to find a balance amongst rigour, feasibility, and cost-effectiveness. In this context, numerical analyses of specimen and inventory data can be used for assessing conservation priorities. We assessed

two quantitative indices to assess the priority conservation value of dry forest groups in the region, i. Genetic Heat Index (GHI) as a measure of global rarity, and ii. a new Conservation Priority Index (CPI) which includes diversity metrics (alpha and beta diversity), endemism, and threats. Results of the two indices were significantly different, and due to the valuable information that both supplied, we suggest a modified CPI where the weight of the endemism parameter is doubled. According to this modified CPI, conservation should be focused on the South American Caribbean Coast, inter-Andean Valleys and in the Llanos dry forests. A biogeographical approach should be used as a framework for conservation planning, and furthermore, binational initiatives are urgently needed between Colombia and Venezuela. These should include a regional protected areas network across political borders, with the aim to promote the connectivity and preservation of the dry forest remnants and the appropriate management of land.

TWENTY YEARS OF DIRECT WORK ON CONSERVATION AND COMMUNITY WELLBEING IN SOUTH AMERICA

Diana Alvira, Field Museum; William Alverson, Field Museum; Nora Bynum, Field Museum; Alvaro del Campo, Field Museum; Robin Foster, Field Museum; Nancy Hensold, Field Museum; Jon Markel, Field Museum; Debra Moskovits, Field Museum; Mario Pariona, Independent; Juliana Philipp, Field Museum; Nigel Pitman, Field Museum; Ashwin Ravikumar, Field Museum; Douglas Stotz, Field Museum; Corine Vriesendorp, Field Museum; Tatzyana Wachter, Field Museum; Alaka Wali, Field Museum

In 1995, The Field Museum made a commitment to conservation and community wellbeing that has grown into a multidisciplinary group of scientists working on the ground in the Chicago Region and South America for the last 22 years. This team puts conservation recommendations anchored on rigorous science—both biological and social—into the hands of decision-makers for direct action. In South America, the team conducts rapid inventories of conservation priorities, works with rural people on community planning, and assembles identification tools for key groups and localities. Since 1999, the team has conducted 29 rapid biological and social inventories that have brought together dozens of diverse partners and hundreds of scientists to survey regions critical for biodiversity conservation and the wellbeing of forest dwellers. Governments in Peru, Ecuador, and Bolivia have used the inventory science to create 17 new conservation areas (23.9 million ha) including national parks (3), national sanctuaries (1), national reserves (1), ecological reserves (1) communal reserves (2), regional conservation areas (4), wildlife reserves (1), reserved zones (2) and municipal conservation areas (2). The Museum's social scientists have helped nearly one hundred indigenous and campesino communities in the Andes and Amazon design community plans focused on managing their lands and maintaining a high quality of life, and linked these plans to municipal funding opportunities. Our team has worked with hundreds of scientists to create more than 500 free field guides and other identification tools for South American biodiversity. Our joint experience suggests the importance of bringing together biologists and social scientists, and points to an increasingly larger role for local, national, and international natural history museums to put the best scientific data and expertise housed in these institutions to build more effective conservation strategies.

UNDERSTANDING CONSERVATIONISTS' PERSPECTIVES ON THE NEW-CONSERVATION DEBATE

Janet Fisher, University of Edinburgh; George Holmes, University of Leeds; Chris Sandbrook, UNEP World Conservation Monitoring Centre

A vibrant debate about the future direction of biodiversity conservation centers on the merits of the so-called new conservation. Proponents of the new conservation advocate a series of positions on key conservation ideas, such as the importance of human-dominated landscapes and conservation's engagement with capitalism. These have been fiercely contested in a debate dominated by a few high-profile individuals, and so far, there has been no empirical exploration of existing perspectives on these issues among a wider community of conservationists. We used Q methodology to examine empirically perspectives on the new conservation held by attendees at the 2015 International Congress for Conservation Biology (ICCB). Although we identified a consensus on several key issues, 3 distinct positions emerged: in favor of conservation to benefit people but opposed to links with capitalism and corporations, in favor of biocentric approaches but with less emphasis on wilderness protection than prominent opponents of new conservation, and in favor of the published new conservation perspective but with less emphasis on increasing human well-being as a goal of conservation. Our results revealed differences between the debate on the new conservation in the literature and views held within a wider, but still limited, conservation community and demonstrated the existence of at least one viewpoint (in favor of conservation to benefit people but opposed to links with capitalism and corporations) that is almost absent from the published debate. We hope the

fuller understanding we present of the variety of views that exist but have not yet been heard, will improve the quality and tone of debates on the subject.

UNDERSTANDING HOW BIOLOGY OF COTTON-TOP TAMARINS INFORMS THE CONSERVATION OF THE SPECIES

Katie Feilen, Disney's Animals, Science & Environment; Juan Carlos Barrios, Fundación Proyecto Tití; German Emeris, Fundación Proyecto Tití; Francy Forero, Fundación Proyecto Tití; Rosamira Guillen, Fundación Proyecto Tití; Felix Medina, Fundación Proyecto Tití; Anne Savage , Disney's Animal Kingdom; Luis Soto , Fundación Proyecto Tití

Understanding the biology of critically endangered species can information conservation efforts and help us understand how species will respond to habitat loss and climate change. Since 1987, Proyecto Tití has focused their research program on 1) long-term monitoring the reproductive and behavioral biology of the cotton-top tamarins (*Saguinus oedipus*), 2) documenting the loss of forested habitat and developing techniques to estimate the remaining wild populations over time, and 3) identifying factors that contribute to the decline of this critically endangered species. From 15 years of behavioral and reproductive hormone data from 10 study groups, we observed 179 infants born at our long-term study site in Santa Catalina, Colombia, 69% were twins, 23% were singletons, and 6% were triplets, with marked seasonality in births corresponding with rainfall and food availability. Although forest threats have increased, average territory size and group size have remained constant, while competition for key resources has increased. Proyecto Tití developed a technique to survey tamarins in the wild and performed the first survey of cotton-top tamarins throughout the historical range of the population in 2005 and found that fewer than 7,000 animals remain in the wild. The survey provided justification to change the IUCN status from endangered to critically endangered. A secondary survey performed five years later, found that conservation efforts can make a positive impact on a critically endangered species as the population has remained stable. However, as the remaining populations live in forest fragments, the need for protecting and reconnecting small fragments became apparent for the long-term survival of the species. The results from our scientific research continue to inform the adaptive management plan of Proyecto Tití and the National Plan for the Conservation of Cotton-top Tamarins.

UNDERSTANDING THE DRIVERS AND IMPACTS BEHIND THE ADOPTION OF LAND SHARING AND LAND SPARING MODELS

Anca Serban, University of Cambridge

Can food security be guaranteed for all, while also shrinking agriculture's environmental footprint? Some argue that achieving this balance will require a landscape where land for nature and agriculture are segregated, land-sparing, while others argue for the integration of the two, land-sharing. Assessments of the two strategies have addressed the productivity and conservation objectives, but, given the diverse roles and interests of different stakeholders, there is a lack of evidence regarding the social acceptability of different models of production, and their implication for food security and local livelihoods. Using a participatory modeling approach land use strategy negotiated by stakeholder groups were co-developed in an agricultural and biodiversity rich landscape of Western Ghats, India. Out of 12 strategies proposed, only 3 met the interest of all stakeholders: intercropping trees (land sharing) and setting aside land for either tree plantations or wildflower meadows while increasing production on the rest of the farm (land sparing). Their hypothetic uptake by direct land users was then tested through a role-playing game and a spatially explicit agent-based model. Across 1057 sampled households the number of different strategies adopted on farms varied from 0 to 3. Conserving wildflower meadows was the most adopted strategy (30%). However, the cumulative land size (~130 acres) was matched by the area under tree intercropping. Tree plantation provided the highest financial return yet was adopted by less than 7% of farmers. Wildflower meadows reduced income inequality the most but at the detriment of food security, showing that reducing decisions to productivity and conservation objectives limits the understanding of the real trade-offs negotiated under different interventions. Testing the suitability of land use interventions provides new theoretical insight and allows policymakers and practitioners to make more robust decisions before implementation.

UNDERSTANDING THE GOVERNANCE OF BIODIVERSITY OFFSETTING: INFORMATION, INSTITUTIONS & POLITICS

Megan Evans / The University of Queensland

Biodiversity offsetting aims to counterbalance 'unavoidable' impacts to biodiversity due to human development by protecting or restoring biodiversity elsewhere. Despite its rapid uptake by governments and businesses worldwide, biodiversity offsetting remains a divisive policy tool, and there is scarce available evidence

of its efficacy. An understanding of the governance context in which biodiversity offset policy is developed and implemented can provide crucial insights into what opportunities may exist for policy improvement. The policy actors involved, their motivations and objectives, and the institutional and organizational incentives in place may all influence the capacity or inclination for biodiversity offset policy to be effectively, efficiently, and fairly implemented. Using a qualitative methodological framework, I conducted semi-structured interviews with stakeholders from government, industry and environment sectors to identify key barriers and enablers to achieving positive outcomes from biodiversity offsetting. Preliminary findings indicate that although improvements in offset policy and metric design has provided regulators and proponents with more guidance on how to implement offset policy, key barriers remain in the way of achieving the desired outcomes from biodiversity offsetting: namely policy uncertainty, lack of capacity for effective oversight, limited public accountability, an inability to make offsetting commercially viable, and the use of offsetting in a piecemeal, non-strategic approach. This research highlights the importance of understanding the governance dimensions of biodiversity offset policy in order to influence ecological outcomes.

UNDERWATER ECOACOUSTICS AS A MONITORING TOOL IN FRESHWATER ENVIRONMENTS

Camille Desjonqueres, Muséum national d'Histoire naturelle; Toby Gifford, Griffith University; Simon Linke, Griffith University; Fanny Rybak, Université Paris-Sud; Jérôme Sueur, Muséum national d'Histoire naturelle

Biodiversity in freshwater habitats is decreasing faster than in any other environment, mostly due to human activities. It is therefore of primordial importance to monitor this loss to guide the attempts at mitigating human impacts. In most comparative or focal studies, sampling strategies use techniques mainly based on trapping and collecting animal and vegetal specimen. Although these techniques have brought valuable data, they are invasive, time-consuming and have most of the time limited spatial and temporal replication. There is therefore a need for the development of complementary methods. As other ecosystems and landscapes, freshwater environments host animals producing sounds, either to communicate or as a byproduct of their life activity. Moreover, ecosystem processes such as organic matter decomposition or plant respiration release gas and produce specific sounds. Soniferous animals and processes can be recorded, remotely, by unattended equipment and provide global information on local diversity and ecosystem health. Such techniques have been developed to monitor marine and terrestrial diversity but have seldom been transferred to freshwater habitats. We will synthesise the knowledge on sound produced by freshwater organisms and ecosystem processes. We will focus on six main challenges that ecoacoustic monitoring has to face: (1) associating each sound to an organism or an ecosystem process, (2) estimating intra-specific and intra-process sound variations, (3) evaluating and considering diurnal variation, (4) modeling spatial sound propagation, (5) deriving links between ecological condition and sounds and (6) developing a central repository for freshwater sounds. We review progress in addressing all these challenges and conclude that passive acoustics represents a potentially revolutionary development in freshwater ecology, enabling dynamic monitoring of biophysical processes to inform conservation practitioners and managers.

UNTANGLING THE EFFECTS OF FORMALIZED TENURE ON FORESTS AND COMMUNITIES IN THE ECUADORIAN AMAZON

Margaret Holland, University of Maryland, Baltimore County, UMBC; Kelly Jones, Colorado State University; Lisa Naughton, University of Wisconsin-Madison

Numerous conservation policies have been implemented in the tropics to curb deforestation, often representing a sequence or portfolio of strategies across varying forms of tenure. The past several decades have seen reliance on strict command and control approaches shift to include decentralized governance of conservation areas, through land titling campaigns or devolution of management authority, and the use of direct economic incentives, through payments for ecosystem services programs. There is often spatial and temporal overlap in these conservation approaches, making it difficult to tease out the impact of a particular policy on land use transitions. In this research, we focus on the case of the Cuyabeno Reserve in the northern Ecuadorian Amazon and analyze forest dynamics over a time period of shifting park definition and management (1975-2013), as well as across scenarios of tenure uncertainty and overlap. We focus specifically on colonists and indigenous communities living within the park, and measure the effect of a tenure formalization program on forests in those parcels. Following the program, approximately 20% of parcels in our study area enrolled in the country's forest conservation incentive program, Socio Bosque. Our approach to this research represents one of mixed methods, including geospatial and impact evaluation techniques, to measure the effect of land titling and direct payments on deforestation, as well as archival research and focus groups to build the narrative and context for this complex case. The results

of this analysis provide critical information on whether or not these layered governance approaches have enhanced forest protection.

UP TO 80% CORAL COVER IN PERIL: VARADERO, AN UNUSUAL CORAL REEF

Valeria Pizarro, Fundación Ecomares; Roberto Iglesias, Penn State University; Mateo López-Victoria, Pontificia Universidad Javeriana Cali; Mónica Medina, Penn State University; F. Joseph Pollock, Penn State University; Fernando A. Zapata, Universidad del Valle; Sven Zea, Universidad Nacional de Colombia

Coral reefs possess an immense biodiversity, and supply millions of people with ecosystem goods and services, especially for those living along the coast. Despite their huge ecologic, aesthetic and economic value, are disappearing at an alarming pace. In the Caribbean, the rate of coral loss is high (5.5-9.2% a year) and constant. In 2013, we discovered a healthy coral reef in one of the least expected places within the Colombian Caribbean. Varadero reef is located at the entrance of Cartagena Bay, a highly-polluted system that receives industrial and sewage waste, as well as high sediment and freshwater loads from an outlet of the Magdalena River (the most populated river basin in Colombia). We assessed benthic composition, mobile invertebrates and reef fish communities, and profiles to describe in detail the structure and zonation on Varadero reef. Below the murky waters, we found high coral cover of 45.1% (±3.9; up to 80% in some sectors), 3 species of lobster, 8 of sea urchin, a fish community composed by 61 species from 24 families, and the typical zonation of a Caribbean fringing reef. All attributes found correspond to a reef that, according to current standards should be considered in "good condition". Unfortunately, the fate of this reef is uncertain due to a project to dredge a second shipping channel that would destroy part of the reef, including over 10,000 coral colonies. Efforts from the research group to inform other scientists, managers, governmental institutions and general public about the existence of this reef have been intense. The need to conserve this reef calls for conservation actions such as the creation of a new marine reserve, and the need for developers and scientists to work together to avoid further environmental destruction due to lack of information, coordination and potentially indifference from the public.

URBAN BUSHMEAT TRAFFICKING: TRAFFICKING FROM THE RURAL TO URBAN CONTEXT IN THE REPUBLIC OF THE CONGO

Rachel Boratto, Michigan State University; Lucie Escouflaire, Wildlife Conservation Society; Meredith Gore, Michigan State University

Illicit supply chains can change the scope, scale, and impact of illegal bushmeat poaching and trafficking. Although conservationists have focused on the topic for decades, noteworthy changes are evident, for example, widespread availability of bushmeat in some urban markets. Such changes have encouraged a call for new ways to understand and resolve risks presented by the illicit trade, both to biodiversity and human populations. The Republic of Congo (RoC) enjoys rich assemblages of biodiversity, including pangolins and elephants. Although selling bushmeat outside local communities is illegal, the sale in urban markets throughout RoC is well-known. Still, little is known about the actors, structures, and mechanisms by which illegal bushmeat moves through the supply chain from hunter to urban vendor. This study uses the interdisciplinary Conservation Criminology framework to examine the phenomenon. Our objectives were to characterize the scope and scale of the illegal bushmeat supply chain, including the structural characteristics which create conditions conducive to trafficking. In June-December 2016, we conducted interviews, structured questionnaires, transportation hub observations, and market surveys, in the city of Pointe Noire and the rural Kouilou region. Urban transportation hubs, served as key points of entry, trade and sale of bushmeat trafficked into the city, with trade at each hub uniquely linked to specific geographic rural regions. The network structure was dominated by "disorganized" network characteristics. Rural transportation of bushmeat was often clandestine, but it was openly traded upon arrival in urban transportation hubs and markets. We interpret results considering the opportunities theories, and the routine activities which underlie the illicit trade. Understanding the urban supply chain structure and factors facilitating the trade provides critical information to future enforcement, prevention and risk-based communication strategies.

URBAN WILDLIFE AND HUMAN DISEASE: USING LANDSCAPE GENETICS OF RATS TO INFORM PUBLIC HEALTH IN BRASIL

Jonathan Richardson, Providence College

The last half-century has seen a sharp transition in human population densities, as more than half the world's population now lives in urban areas. This pattern is even more dramatic in developing countries, and has distinct

and important consequences for urban dwelling species and landscape dynamics. Salvador, Brasil is a large city of three million residents that has experienced a 280% increase in its population since 1970. Much of this added population is concentrated in slum settlements, known as favelas, that are characterized by refuse piles, open sewage and overgrown vegetation. These conditions promote rodent infestations, particularly the Norway rat (*Rattus norvegicus*) – a reservoir host for the zoonotic pathogen that causes leptospirosis. Leptospirosis outbreaks occur each year in favelas during the wet season, and millions of dollars are spent annually on public health campaigns designed to eradicate the Norway rat vector. In order to target eradication efforts, epidemiologists and public health officials have requested information on the areas that serve as suitable rat habitat and where rats are moving between these habitats. We estimated the amount of gene flow occurring within and across seven favela communities in Salvador for >700 Norway rats trapped over 5 years. We used a landscape genetics approach to characterize the role that the local and neighborhood landscape plays in shaping the connectivity across the urban landscape, including topography, trash disposal and socioeconomic measures. This information is being used to target future eradication strategies by local public health authorities in Salvador.

URUGUAY'S PROTECTED AREAS: INTEGRATING CONSERVATION BETWEEN SCALES AND PUBLIC POLICIES

Paola Mejia, Sistema Nacional de Áreas Protegidas; Lucía Bartesaghi, Sistema Nacional de Áreas Protegidas; Soledad Mantero, MVOTMA - División Sistema Nacional de Áreas Protegidas; Mariana Ríos, Sistema Nacional de Areas Protegidas; Alvaro Soutullo, Centro Universitario Regional Este

In Uruguay, the National System of Protected Areas (NSPA) planning incorporates the lessons learned at the international level and is based on the conceptual framework of systemic and systematic conservation planning—in which value of each protected area (PA) is given by its contribution to the whole system—and in adaptive management, understanding that the information available for better management of environmental systems, particularly PA, is never enough. The first step in creating the Uruguayan NSPA, was defining spatially explicit biodiversity conservation targets and NSPA representation goals. Based on the established objectives, an analysis of representation gaps and a spatial conservation prioritization process was performed, considering pressures and opportunities at country level, which followed the notion of adaptive planning. This design is subject to periodic revision that considers newly available information. The effectiveness of management of each PA is measured in terms of how much it reaches conservation targets as well as it contribution to the conservation targets defined at the system level, thus seeking to report results at PA level and at the NSPA level articulately. In addition, the NSPA has managed to incorporate its biodiversity conservation goals into other public and private planning and territorial management policies, which has allowed the NSPA to meet its objectives beyond the surface it protects through its specific regulations. The NSPA Strategic Plan 2015-2020 includes specific strategies to incorporate its conservation targets into national, and departmental land-use planning instruments and into environmental impact assessment processes outside the NSPA areas, as well as in private sector conservation strategies or other conservation figures such as private reserves. This presentation aims to contribute to the learning process implicit in the Open Standards for the Practice of Conservation, sharing the Uruguayan NSPA experience.

USING BEHAVIORAL ECOLOGY TO IMPROVE REINTRODUCTION OUTCOMES

Debra Shier, San Diego Zoo Institute for Conservation Research

Reintroduction programs (captive-breeding reintroduction and translocation) are used to introduce species to parts of their historic range. Though they are increasingly popular conservation tools, most fail to produce sustainable populations. For many species, high mortality during the initial establishment phase has been blamed on ineffective post-release behavior. In particular, long distance movement, "dispersal" from the release site, is common and makes newly released animals easy targets for predators. To deal with this problem, biologists have been conducting studies to ensure that captive animals slated for release exhibit effective survival skills such as foraging, habitat selection, antipredator and shelter use behaviors. In addition to behavioral competency of captive releasees, utilizing the target species' behavior when developing release methodology can be an effective way to facilitate the post-release settlement process and improve reintroduction outcomes. In this talk, I examine the importance of social interactions for both learning in the ontogeny of antipredator behavior and discuss how the establishment and maintenance of social relationships during translocation of both solitary and social species affects survival post-release. I will explore the fitness benefits of paying attention to habitat preferences for release site selection and preparation. Finally, I will discuss ways to utilize interspecific interactions to guide

reintroduction planning decisions. I use case studies from research on a variety of mammals including Black tailed prairie dogs (*Cynomys ludovicianus*), Stephen's kangaroo rats (*Dipodomys stephensi*), Pacific pocket mice (*Perognathus longimembris pacificus*) and Tasmanian devils (*Sarcophilus harrisii*) to illustrate how an understanding of basic behavioral science can be crucial for conservation management.

USING CONSERVATION PLANNING TO ENGAGE WITH GOVERNMENT DECISION MAKING: LESSONS FROM SOUTH AFRICA

Fahiema Daniels, South African National Biodiversity Institute; Tammy Smith, South African National Biodiversity Institute

South Africa is recognised as a mega-diverse country, containing 3 global biodiversity hotspots. As a developing country, with high levels of biodiversity, prioritisation of biodiversity features for conservation has a long history in the country, dating back to the 1970s. In the late 1990's and early 2000's, South Africa piloted some of the first systematic conservation plans, to identify priority areas for conservation. A range of technical innovations and different social processes have been developed to improve uptake of these plans. In 2004, South Africa promulgated its National Environmental Management: Biodiversity Act, which made provision for the identification of biodiversity priority areas that could be legally gazetted. These priority biodiversity areas are categorised into "Critical Biodiversity Areas" and "Ecological Support Areas" and have to be taken into account in multi-sectoral spatial planning tools by local municipalities. Furthermore, these priority biodiversity areas feed into the decision-making process for development applications through Environmental Impact Assessment. This talk will focus on lessons learned from South Africa, focusing on: (1) An enabling legal framework for including biodiversity priority areas in planning and decision making and planning; (2) Using the technical outputs of a conservation planning exercise to identify pragmatic biodiversity priorities; (3) Products, resources and processes that required for uptake of the maps of biodiversity priority areas in planning and decision making. Furthermore, we discuss the significant value in creating a community of practice that supports the development of plans, while ensuring consistency in terminology and the layout of products.

USING METHODS FROM ECONOMICS TO UNDERSTAND CONSUMER PREFERENCES FOR WILDLIFE

Amy Hinsley, University of Oxford

There is growing awareness that enforcement and regulation alone are unlikely to be effective in tackling the illegal wildlife trade, and that more diverse interventions are needed to address the threat trade poses to thousands of species. This diversification has led to 'demand side' approaches, including campaigns that aim to reduce or change consumer demand for illegal wildlife products, mainly focusing on large consumer markets in Asia. To increase the chance that these interventions are effective in the long term, an understanding of the factors and preferences that underpin consumer demand is needed. The field of economics has several well-established theories and methods focused on consumer demand that are highly relevant to conservationists hoping to understand and influence wildlife markets. These include those methods based on utility theory and the theory of rational choice, which state that demand is comprised of individual consumers making predictable choices based on the amount of utility they get from different goods or services. Studying this utility often involves determining consumers' preferences and 'Willingness to Pay' for different product attributes, which can be done through either 'revealed preference' (using real-life records of prices and trade volumes to estimate preferences) or stated preference methods (using surveys to ask consumers hypothetical questions about preferences). Revealed preference methods may be more difficult to apply to markets that are secretive due to illegality, but stated preference methods including choice experiments and contingent valuation have been used to study demand in the wildlife trade already, and have potential for further application. The benefits and drawbacks of using these methods and the potential for their future use will be discussed using examples of existing studies of consumer preferences in the global trade in orchids, and the markets for farmed and wild bear bile in China.

USING MULTIPLE LINES OF EVIDENCE TO ASSESS THE RISK OF ECOSYSTEM COLLAPSE

Lucie Bland, The University of Melbourne; Minh Dinh, University of Queensland; Renata Ferrari Legorreta, The University of Sydney; David Keith, NSW National Parks & Wildlife; Rebecca Lester, Deakin University; David Mouillot, Université Montpellier 2; Nicholas Murray, University of Queensland; Hoang Nguyen, University of Queensland; Emily Nicholson, Deakin University; Tracey Regan, The Arthur Rylah Institute for Environmental Research

Effective ecosystem risk assessment relies on a conceptual understanding of ecosystem dynamics and the synthesis of multiple lines of evidence. Risk assessment protocols and ecosystem models are able to integrate limited observational data with threat scenarios, making them

valuable tools for monitoring ecosystem status and diagnosing key mechanisms of decline to be addressed by management. We applied the IUCN Red List of Ecosystems criteria to quantify the risk of collapse of the Meso-American Reef, a unique ecosystem containing the second longest barrier reef in the world. We collated a wide array of empirical data (field and remotely-sensed), and used a stochastic ecosystem model to backcast past ecosystem dynamics, as well as forecast future ecosystem dynamics under 11 scenarios of threat. The overall status of the ecosystem was found to be Critically Endangered (plausibly Vulnerable to Critically Endangered), with notable differences among Red List criteria and data types in detecting the most severe symptoms of risk. The ecosystem is at high risk from mass bleaching in the coming decades, with compounding effects of ocean acidification, hurricanes, pollution, and fishing. Our case study provides a template for assessing risks to coral reefs, and for further application of ecosystem models in ecosystem risk assessment.

USING SCIENCE TO PRODUCE FUZZY MAPS OF REGIONAL CONNECTIVITY AND UNFUZZY CORRIDOR CONSERVATION PLANS

Paul Beier, Northern Arizona University

Planning for connectivity includes two main products: (1) Defining natural landscape blocks throughout a state or region and developing a map of 'fuzzy' linkages between neighboring blocks. These make transportation agencies and land-use planners aware of the need for corridors, and alert conservation advocates to threats and opportunities. (2) Developing linkage designs (implementable corridor conservation plans) for specific linkages. Recent work provides three insights about these designs. First, these designs should focus on needs of low-mobility habitat specialists that require live-in habitat within the corridor; mobile habitat generalists (like large carnivores) will use corridors designed for specialists. The generalists can be important flagships for the corridor, but should not drive its design. Second, dispersers readily pass through habitat features that are unsuitable in the home range, and avoid only the worst conditions. Third, planning corridors for climate change does not need to model response of individual species to uncertain climate projections. These 3 insights provide management agencies flexibility in where to conserve a corridor: as long as corridors are wide, avoid mines and urban areas, and have excellent crossing structures across linear barriers (roads, canals) they will probably support movement and gene flow for most species. Corridor width is the main unresolved scientific issue. Until the effect of corridor width on gene flow has been empirically determined, minimum width should be 1 km for corridors up to 10 km long and 2 km for longer corridors.

USING THE NEXUS BETWEEN TRADITIONAL KNOWLEDGE AND WESTERN SCIENCE TO ADVANCE CONSERVATION GLOBALLY

Cristina Eisenberg, Earthwatch Institute; Mike Bruised Head, University of Lethbridge; Kansie Fox, Kainai Environmental Protection Agency; Leroy Little Bear, University of Lethbridge

Achieving conservation objectives by conducting ecological research on a landscape scale involves addressing the needs and concerns of multiple stakeholder groups. When working in a region that includes Indigenous communities, it also means working across the deep cultural divide that often exists between Traditional Ecological Knowledge and Western science. We will present the lessons learned and partnerships developed in restoring bison (*Bison bison*), fire, wolves (*Canis lupus*), and fescue (*Festuca spp.*) grassland habitat in southwest Alberta, Canada by the Kainai First Nation, the Kainai Environmental Protection Agency, Waterton Lakes National Park, and Earthwatch Institute, using collaborative, co-created science that balances Traditional Ecological Knowledge and Western Science. This research is part of a transboundary bison reintroduction taking place in the US and Canada. In working toward bison repatriation in this landscape, we have found that partnerships at federal and tribal governmental levels that include non-governmental organizations and universities can deeply engage landowners, tribal elders, citizen-scientist volunteers, students and their teachers, and ecologists. Such collaboration provides a powerful heuristic framework to do ecological research and advance conservation. This model incorporates education, which is a key element in strengthening relationships and finding solutions to conservation challenges. It feeds back knowledge gained on multiple levels, creating financial benefits, improving ecosystem services, and empowering Indigenous communities in land stewardship. We will discuss the development of such partnerships and the applicability of our collaborative, co-created science model to other ecosystems globally, providing real-world examples from our work.

USING THE RED LIST TO MAP THREAT TO BIODIVERSITY

Michael Harfoot, UNEP World Conservation Monitoring Centre

Understanding where threats to wildlife are greatest is important for prioritising and planning responses at

varying geographic scales. We use threat data for all terrestrial mammal, amphibians and birds included in the IUCN Red List assessment to identify the global distribution of the occurrence of threat from, amongst others, exploitation, habitat conversion and invasive species. We identify "hotspots" by mapping the likelihood of co-occurrence of threats to species globally and nationally. Our analysis identifies where multiple threats might coincide and thus have simultaneous impacts on species. We suggest that such combinations of threats indicate the need for strong and coordinated policy responses, and considers the utility of applying such novel threat mapping techniques to inform biodiversity conservation interventions both globally (in particular through Multilateral Environmental Agreements (MEAs)) and at the national level.

USING U.S. LAWS TO LEVERAGE GLOBAL CONSERVATION GAINS

Brett Hartl, Center for Biological Diversity

This presentation will introduce the symposium, which focuses on how U.S. environmental laws can provide creative tools to promote conservation objectives beyond the United States' borders. For example, in 2016 the Obama administration finalized a set of regulations that will ultimately help prevent the drowning deaths of 650,000 marine mammals worldwide each year by requiring that every nation which seeks to import seafood into the United States meet with the strict, protective standards of the Marine Mammal Protection Act. These new regulatory measures also offer one of the last potential regulatory incentives to compel Mexico to save the last 30 Vaquita from extinction. This presentation will discuss this case study and several others, including how the U.S. Clean Water Act has helped limit the spread of aquatic invasive species in ballast water, and how the Endangered Species Act led to a Caribbean-wide recovery planning effort for the elkhorn and staghorn coral.

VARIATION IN NORTH AMERICAN RELIGIOUSLY MOTIVATED CONSERVATION ACTIVISM

David Johns, Portland State University; Wildlands Network; Marine Conservation Institute

Analyzing three cases of North American conservation activism with religious involvement reveals a range of variation in all factors. In the case of the Evangelical Environmental Network's defeat of legislation to weaken the US Endangered Species Act, religiously motivated NGOs took the lead given the political circumstances. They overcame industry and religious opponents, with secular groups providing political expertise. In another case—the two-decade battle of the Zuni tribe to defend sacred lands from a coal strip mine—we also see religious groups in the lead with support from secular NGOs; the Zuni broke new ground with their campaign. As with the EEN, they undertook morality-based mobilization. Finally, we look to the creation of the Northeast Canyons and Seamounts Marine National Monument. Here Interfaith Oceans, an ecumenical group, moved first in parallel with secular groups and then in cooperation with them, to bring pressure in support of successful monument designation. Religious groups were a critical constituency.

WHAT BIODIVERSITY INFORMATION DOES BUSINESS NEED?

Leon Bennun, The Biodiversity Consultancy; Jenny Arias Escandon, The Biodiversity Consultancy; Eugenie Regan, The Biodiversity Consultancy

Biodiversity and ecosystem services are increasingly material issues for business, relating to management of regulatory and reputational risk, ensuring access to capital, supporting social license to operate, understanding dependencies and vulnerabilities, and disaster-risk reduction. These issues have stimulated an apparently disparate set of business responses including safeguard frameworks for finance, No Net Loss commitments, Natural Capital Accounting and integrated corporate reporting. For these responses to contribute positively to biodiversity conservation, a solid information base is essential. Fundamental elements of this include the status and trends of species and ecosystems, location of sensitive sites, and reliable maps of landcover and landscape connectivity. Information on the options, costs and success rates for impact minimisation and restoration measures is also key. The current information base is geographically patchy and often has major gaps, especially in the biodiversity-rich tropics and for the effectiveness of interventions. Accessibility of information is also a constraint. Understanding business needs can help conservation science to prioritise gap-filling and data access enhancements, to improve the quality and management of biodiversity data collected by business itself, and to facilitate re-incorporation of such data in the information base.

WHAT DO CONSERVATIONISTS THINK? RESULTS FROM THE GLOBAL FUTURE OF CONSERVATION SURVEY

Chris Sandbrook, UNEP World Conservation Monitoring Centre; Janet Fisher, University of Edinburgh; George Holmes, University of Leeds; Rogelio Luque Lora, University of Cambridge

There have long been vibrant debates about the future of conservation, the principles, objectives and approaches that should underpin efforts to conserve biodiversity. Yet such debates have tended to be dominated by a narrow demographic, particularly white, male conservation biologists from the global North, and it is unclear whether views held by this demographic are representative of the views held more generally within the conservation community, and whether conservation is more or less divided on key issues than such debates may indicate. This paper presents the results of what we believe to be the first global scale survey of conservationists on their views on the issues at stake in these debates. Using a web based tool, entitled "the Future of Conservation", we surveyed the opinions of conservationists on a number of important issues. We focused in particular on two themes dominating recent debates in conservation, namely the relative prevalence of biocentric versus anthropocentric motivations for conservation, and of positive and negative attitudes regarding the relationship between conservation and capitalism. We explore how attitudes held by conservationists vary by gender, nationality, educational background, their status as researcher or practitioner, relative seniority, and other key factors. The results illustrate the variance of opinion within conservation, the level of plurality of views within it, and potential ways of creating more productive debates about the future of conservation.

WHAT DOESN'T WORK AGAINST WILDLIFE TRAFFICKING? LEARNING FROM ASIA

Alex Diment, Wildlife Conservation Society

The illegal wildlife trade (IWT) is a substantial threat to many threatened species. Strong demand for exotic products, often driven by cultural norms in the vast human populations in Asia, has led to transnational wildlife trafficking becoming a major conservation concern. Countries with strong domestic demand, and their near neighbors, have faced huge pressures on wild populations in recent decades, and have applied a range of measures against the trade, with varying degrees of success. Continued demand and dwindling supply is now spreading these pressures further afield, with transcontinental trade becoming increasingly common. There is potential to learn from the experiences of Asia and apply this to other regions, though monitoring the impacts of interventions is often poor, and experience is seldom formally shared, especially in the case of failure. This talk intends to support learning the lessons from research and experience in Asia, and how they could apply to IWT in Latin America. I will assess the evidence-base for interventions, in particular examining several failures to protect high-commercial value wildlife. While demand reduction and trafficking prevention are important long-term interventions, preventing poaching in-situ is fundamental for ensuring the persistence of wildlife.

WHAT IS A COYOTE? THE DISCOURSE OF HUMAN-COYOTE INTERACTIONS IN AN URBAN AREA

Megan Draheim, Virginia Tech Center for Leadership in Global Sustainability; Susan Crate, George Mason University; Edward Christien Parsons, George Mason University

The language that people use when discussing wildlife and human-wildlife interactions matters, and it can greatly influence the way that conservation practitioners should go about working with the public on conservation issues. Many conservation conflicts can become polarized and communication between the various sides can break down rapidly. This places conservation professionals in a difficult position as they attempt to navigate and balance different voices and the needs of wildlife. In urban areas with a large concentration of people and perspectives, human-wildlife interactions can become controversial and the discourse around them can become heated. This is especially true of predators that can be found in urban areas, including the coyote. Coyotes are of interest to urban conservationists as they can both positively impact urban ecosystems and spark a variety of reactions, from enjoyment to anger to fear. Understanding the discourse around such urban conservation issues as human-coyote interactions can help conservation practitioners develop effective outreach strategies and talking points for communities. This study used qualitative research to analyze the discourse surrounding human-coyote interactions in two suburbs outside of Denver, Colorado, USA, at a time when coyotes were a very polarizing subject. We conducted interviews with residents of the two towns, as well as volunteers with coyote coexistence programs, and also analyzed local letters to the editor and op-ed pieces. Using a grounded theory methodology, we found several categories of discourse that could help conservation professionals navigate complex and high-profile urban conservation issues. We discuss each of those categories as it relates to our findings in this particular situation, and also discuss them in the context of larger urban conservation issues.

WHAT IS HINDERING THE SUCCESS OF CONSERVATION TRANSLOCATIONS?

Oded Berger-tal, Ben-Gurion University of the Negev; Daniel Blumstein, Dept Ecol & Evolution Biology; Ron Swaisgood, San Diego Zoo Global

Translocations are a common conservation and management strategy, but despite their popularity, translocations are a high-cost endeavor with a history of failures. It is therefore imperative to maximize the success of translocations by learning from our collective experience. The Global Re-introduction Perspectives Series is a collection of translocation case studies, presented in a highly structured format with an emphasis on practical information. All case studies include a section in which the authors list the difficulties they have faced during the translocation project, with over 1,000 difficulties described. We reviewed all difficulties reported in the series to get insights into the common 'spokes in the wheels' of animal translocations. In this talk I will present our results, discuss interesting trends and differences in translocating animals of different taxa and set the stage for the more in-depth investigations of several of the most common difficulties which will comprise the rest of the symposium.

WHAT THE 'WAR ON DRUGS' AND PROHIBITION CAN TELL US ABOUT COUNTERING THE ILLEGAL WILDLIFE TRADE

Simon Hedges, Wildlife Conservation Society

Many economists draw attention to the failure of the 'War on Drugs' (WoD) arguing that prohibition-based efforts to combat the illegal wildlife trade (IWT) will similarly fail as well as removing communities' stakes in conservation. A better approach, they argue, is a legal trade in wildlife. There are good reasons for comparing the WoD and IWT including (1) both involve trade in products that were formerly legal and (2) banning trade in these products drove the trade underground and lead to the involvement of organized crime. However, legal trades in wildlife have been undermined by parallel illegal trading in the same products. It is important to understand why such parallel trading happens but here the WoD is not very informative. Fundamental differences between the trades in drugs and wildlife are of greater importance: (1) supply of ivory, rhino horn, and other wildlife products is finite and often small relative to levels of demand but the supply of illegal drugs is easily increased and (2) the nature of demand for wildlife products can change both radically and quickly. This nexus of economics and biology places limits on the trade in wildlife that do not apply to drugs. It is for such reasons that the success of even the previous exemplars of sustainable legal trade, e.g., vicuna and crocodilians, have been challenged. We must, therefore, identify which species can be traded sustainably and why. But what about those species whose biology and socio-economic context preclude sustainable trade? Several additional differences between the trades in drugs and wildlife should give us hope: (1) ivory, rhino horn, and other wildlife products are not addictive; (2) there is much higher global demand for drugs than there is for wildlife products; and (3) the demand for drugs spans the globe but the main markets for ivory and many other wildlife products are in only a few countries. These differences can be exploited to combat IWT without undermining local livelihoods.

WHERE THE NOISY THINGS ARE: EXAMINING SPATIO-TEMPORAL PATTERNS IN UNDERWATER SOUNDSCAPES

Angela Recalde Salas, Centre for Marine Science and Technology, Curtin University; Sarah Marley, Centre for Marine Science and Technology, CMST, Curtin University; Christine Erbe, Centre for Marine Science and Technology, CMST, Curtin University; Iain Parnum, Centre for Marine Science and Technology, CMST, Curtin University; Miles Parsons, Centre for Marine Science and Technology, CMST, Curtin University; Chandra Salgado Kent, Centre for Marine Science and Technology, CMST, Curtin University

There is growing awareness of underwater noise in a variety of marine habitats, and how such noise may adversely affect marine species. However, in order to ascertain the potential impacts of man-made noise, baseline information is required for characterising marine soundscapes. This is particularly true for acoustically-specialised animals, such as cetaceans. This study considered spatial and temporal variation in the acoustic habitats of bottlenose dolphins (*Tursiops aduncus*) within Western Australia. Two sites were considered: the urban Swan River and the relatively pristine Roebuck Bay. Data on the acoustic habitat of these areas were collected using autonomous underwater acoustic recorders. The soundscape was then described via a variety of techniques, including: weekly spectrograms, power spectrum density percentile plots, octave-band levels, broadband noise levels, and generalised estimating equations. Acoustic datasets collected at five Swan River sites from 2005 to 2015 indicated that sites were characteristic in their prominent sound sources, showing clear among-site variations. Variation in broadband noise levels also occurred at a fine temporal scale within sites, although sites differed in the significance of temporal variables. As a result, some sites were 'noisier' than others, with the Fremantle Inner Harbour being noisiest from an anthropogenic perspective. This noisy site was then compared with the relatively pristine acoustic environment of Roebuck Bay. The latter's local soundscape was dominated by biotic sounds, whereas anthropogenic noise was prevalent in the former. Consequently, dolphin communications had a greater potential to be masked more frequently in the Fremantle Inner Harbour than in

Roebuck Bay. Overall, this study shows how underwater acoustics can be used to quantify anthropogenic impacts on marine habitats, consider potential consequences of altering 'quiet' habitats, and inform management decisions.

WHO WILL CONSERVE? UNDERSTANDING STAKEHOLDERS TO IMPROVE PRIORITIZATION OF PRIVATE LAND CONSERVATION

Elizabeth Law, University of Queensland; Peter Arcese, University of British Columbia; Amanda Rodewald, Cornell Lab of Ornithology; Richard Schuster, University of British Columbia; Kerrie Wilson, University of Queensland

Biodiversity conservation planning in private areas is challenging, as there are no guarantees that landholders with prioritised parcels will comply with conservation requirements. One solution to this problem is to treat participation as uncertain. This approach is inefficient, however, as not all landholders will have the same probability of participation, and these are also likely to vary with alternative policy options. Given observed low rates of conservation easement and tax program participation, even small reductions in the uncertainty could lead to large improvements in targeting and cost effectiveness of the program. We use market segmentation methods to identify potential stakeholder groups for our study region in south-western Canada, based on observable biophysical, cadastral, and census variables hypothesized to influence participation and behaviour in conservation easement and tax programs. Using known rates of uptake, we compare conservation priority designations, and likely outcomes, from three scenarios: 1) no consideration of participation rates, 2) consideration of uniform participation rates, and 3) uptake rates differentiated using market segmentation. Identified stakeholder groups can also be used to stratify sampling for further research surveying stakeholder preferences and willingness to participate. This could further improve policy design by identifying avenues that will provide the most cost-effective conservation across private lands.

WILD FAUNA ON THE MENU: CHALLENGES AND OPPORTUNITIES FOR THE FUTURE

Nathalie Van Vliet, CIFOR

Whether they are obtained through hunting, fishing or harvest, wild animal products continue to contribute to the diets of human populations. This presentation illustrates the diversity of wild animals foods in different ecosystems of the world, ranging from fresh water and marine animals, to amphibians and reptiles and terrestrial animals (insects, birds, mammals). We discuss the different challenges and opportunities for wild animals to continue to feed humans including the ecological sustainability of the harvest, the health and food safety challenges associated with the consumption of wild animals and the competition from highly processed and industrialized meats characteristic of the nutritional transitions. We argue that, in the context of future sustainable food systems, there is scope that wild foods will continue to be in the menus and may well remain legitimate components of diversified diets. A clear prerequisite is to bring the contribution of wild animal foods into national statistics.

WILD FISH AND WILD MEAT ON THE MENU IN COLOMBIA LEGAL OPPORTUNITIES AND BOTTLENECKS FOR THE FUTURE

Juanita Gómez, Fundación Science International; Nathalie Van Vliet, CIFOR

Wild animals have a special importance in Colombian rural contexts where access to other sources of protein is limited. In rural communities, fishing and hunting provide food and generate income for household subsistence. Generally, part of the products from wild animals are consumed within the family and the remaining surpluses are traded to acquire other foods or other subsistence goods to satisfy basic needs. Under Colombian legal framework, fishing and hunting for subsistence are limited to family consumption, and not further regulated to guarantee sustainable use. Wild fish and wild meat trade, even in small amounts, is subject to a license, permit or authorization. Interestingly, regulations on the commercial use of wild fish significantly differ from those applying for wild meat. Regulations for the commercial use of wild fish are clear, more simple to comply with, and require less information to prove sustainable use. On the other hand, legal opportunities for the commercial use of wild meat remain blurred due to a lack of regulations and the complex requirements. As such, the widespread practice of selling wild meat in Colombia clearly happens illegally. The reasons for these differences in the legal requirements to obtain a commercial permit for wild fish and wild meat are based on somehow arbitrary institutional differences regulating their use but not on the sustainability of the practice. Considering the relevance of both hunting and fishing for rural livelihoods it is important to question why hunting has been marginalized under the current legal framework, as compared to wild fish. What guarantees does the current legal framework offer for the sustainable use of wild fish and wild meat for the future? In this presentation we give some elements of responses to this question and provide some recommendations for public policies.

WILDERNESS CONSERVATION AND THE WORLD HERITAGE CONVENTION

James Allan, University of Queensland

Identifying where threatening processes are impacting biodiversity is essential for directing conservation actions to save imperiled species. Here we present the first global analysis of human impact on threatened biodiversity by jointly considering the distributions of species, their threats, and mapping the extent of species-specific threats across distributions at a 30km2 resolution. We find that large areas of the world's biodiversity hotspots and protected areas are highly impacted by humans. By contrasting our global impact map with species richness, we identify impact free refugia and find that on average only small portions of species ranges remain as refuges. This provides a new perspective on the scale of the challenges facing biodiversity conservation, however all the threats we map can be overcome by in situ management actions. Massive investment in making current protected areas impact free would increase the area of threatened species refugia substantially. Our framework for moving beyond threats, towards mapping actual impacts, is a conceptual advance for the field of cumulative threat mapping and offers a tool for prioritizing policy and management responses to avert the ongoing biodiversity extinction crisis.

WILDLIFE GUARDIANSHIP: WILLINGNESS TO INTERVENE IN THE FACE OF WILDLIFE CRIME

Jessica Kahler, Michigan State University; Meredith Gore, Michigan State University

Guardianship is a concept from mainstream criminology that examines the willingness of stakeholders to assume an informal role as protectors and intervene if necessary to disrupt crimes. In order to investigate the usefulness of using this criminological concept to understand stakeholder willingness to intervene if they see wildlife crimes taking place, we conducted 400 interviews in and around the intensive protection zone of Bukit Barisan Selatan National Park (BBSNP) on the island of Sumatra, Indonesia. BBSNP is home to critically endangered species such as Sumatran elephant, rhinoceros, and tigers. Results investigate the connection between key factors of guardianship: willingness to intervene, ability to supervise, and willingness to supervise. To measure willingness to intervene we asked stakeholders what they would do if they witnessed a known poacher entering the forest with tools to poach and fit the responses to 5 categories of criminological interventions ranging from 'turning a blind eye' to both directly (e.g., confronting the suspect) and indirectly (e.g., alerting authorities) intervening. The most common responses fit 'turning a blind eye' (n= 103; 25.8%), indirect intervention by calling authorities (n=99; 24.8%) and the direct intervention of talking to the suspect (n=94; 23.5%). Questions that explored the ability and willingness to supervise were also conducted. Further, we examined overall willingness to serve as wildlife guardians by exploring how it related to attitudinal concepts in criminology (e.g., crime seriousness), natural resources (e.g., wildlife value orientations), and risk and decision sciences (e.g., risk perception). Defining, measuring, and understanding what factors influence local wildlife guardianship behavior is a valuable step in designing communication, education, incentives, and interventions aimed at reducing wildlife and engaging local communities in conservation and wildlife crime prevention efforts.

WILL TROPICAL DRY FORESTS BE VULNERABLE OR RESISTANT TO CHANGES IN RAINFALL?

Jennifer Powers, University of Minnesota

Rainfall regimes in the tropics are changing. Models and observations suggest that seasonally dry tropical forests will experience increased variability and decreased annual totals of rainfall. One the one hand, tropical dry forests are adapted to seasonal drought and thus may be resistant to increasing drought; on the other hand, these forests may already be near hydraulic thresholds and thus vulnerable to drought. We combined an eight-year mortality record from forest inventory plots with transect data to investigate whether a severe El Niño event in 2015 resulted in elevated mortality in regenerating dry forests in northwestern Costa Rica. Our objectives were to determine whether certain species and size classes were more vulnerable, and which functional traits correlate with responses to drought. Annual rainfall ranged from 1113 to 2820 mm the first six years of the study, but was severely reduced to 627mm in 2015 during the ENSO event. From 2009-2014, mortality rates ranged from 0.5 to 3.3% per year, but increased significantly to 7.7% in 2015. Mortality rates during the drought ranged from 0 to > 50%. The probability of mortality varied significantly among species and crown cover class, but there was no preferential mortality as a function of tree size. For the 31 most abundant species, we calculated Spearman rank correlation coefficients between mortality rates during the drought and wood density, vessel diameter and density, foliar nitrogen, specific leaf area, maximum height, and turgor loss point. These traits did not predict susceptibility to drought. Forest community composition will likely change as rainfall regimes change. In conclusion, our results underscore that tropical dry forest trees species vary tremendously in their susceptibility to drought, and

highlight the need for more research on the specific physiological mechanisms that underlie tree responses to drought.

WORKING AT THE INTERFACE: APPROACHES THAT ENHANCE THE CONTRIBUTION OF SCIENCE TO REAL WORLD

Melanie Ryan, Luc Hoffmann Institute/ University of Cambridge; Carina Wyborn, Luc Hoffmann Institute

The interface between conservation science-policy-practice is complex and contested. Commonly cited challenges are varied and range from cultural differences, mismatched temporal demands of research and policy cycles, difficulties reaching a shared understanding of complex issues, right through; to imbalances in power, politics and vested interests. Within this space, 'knowledge co-production' is the concept de jour, promising that greater inclusion of different types of knowledge, focused on addressing a specific problem, will lead to evidence informed decisions that will create greater societal benefits, while overcoming some of the aforementioned challenges. The promise of co-production is easy to aspire to, but difficult to operationalise in practice. This talk will draw on decades of theory and practice in the social sciences to outline a range of tools, concepts and approaches that can help conservationists wanting to work across the traditional boundaries of science, policy and practice. Additionally, it will introduce foundational ideas laying an alternate pathway along which science can contribute to conservation impact. The talk will outline of a set of principles that can be used to inform the different stages of project design, implementation, and evaluation of projects seeking to 'do science differently' to make a more effective contribution to addressing real world conservation problems.

"THEY LOOK AT LAND LIKE A LINE ITEM": ASSESSING SOCIAL ECOLOGICAL BARRIERS TO FOREST RESTORATION

Abigail Dan, University of British Columbia; Jeanine Rhemtulla, University of British Columbia

The path to restoring forests on a globally significant scale is ill defined, though many governments have made ambitious reforestation commitments, including the Bonn Challenge, which aims to restore 350M ha of forest worldwide by 2030. Pro-poor reforestation depends on cooperation of forest resource users, yet few studies have rigorously assessed local perspectives on obstacles and solutions in the restoration planning process. Malawi presents an apt case study; it experienced high rates of post-colonial population growth and forest cover loss, and has the lowest per capita GDP globally. Under the Challenge, the government pledged 4.5M ha of reforestation by 2030—38% of the country's land area—and records millions of trees planted, yet project success is low. To understand what has kept forest restoration from being ecologically or socially successful in Malawi, we invited citizens from rural villages, government forestry staff and academics to participate in focus groups in July 2016. Village participants were grouped by gender, age, and community leadership experience, to explore how these factors influence perceptions. We used an adapted Systems Thinking (ST) approach to elicit discussion on how key drivers such as livelihoods, governance, enforcement and climate change interact, and relate to project failure. We then constructed a participant-defined Bayesian Belief Network (BBN) with each group, identifying the most important problem to overcome for ecologically and socially successful reforestation, and the factors most critical to surmounting it. Villagers unanimously identified poverty alleviation as the central problem but prioritized different factors in solutions by age. In contrast, government staff envisioned economic development through reforestation. We conclude that the ST-BBN approach offers a practical method for decision-makers to incorporate local knowledge and values into planning and policy in the global race to restore forested landscapes.

A CENTURY OF ECOLOGICAL CHANGE REFLECTED IN THE STABLE ISOTOPES OF A MIGRATORY AERIAL INSECTIVORE

Philina English, Centre for Wildlife Ecology, Simon Fraser University; Jasmine Crumsey, Stanford University; David Green, Simon Fraser University; Joseph Nocera, University of New Brunswick; Vanya Rohwer, Cornell University

Identifying the mechanisms of ecological change is challenging in the absence of long-term data. Aerial insectivores are exhibiting the steepest population declines of any avian guild in North America. One hypothesis for these population declines is a change in availability of their prey; however, we lack long-term data on insect abundances. Fortunately, stable isotope ratios of museum specimen tissues may provide a record of diet and habitat change through time. Nitrogen isotope ratios (d15N) increase with trophic level, while carbon isotope ratios (d13C) increase with agricultural intensification. We use stable isotopes of museum tissues to test for diet change in a nocturnal aerial insectivore *Antrostomus vociferous*. We measured temporal changes in d15N and d13C of bird tissues grown on wintering grounds (claws) and during breeding season (feathers) from museums specimens spanning 1880-2005, and contemporary samples from breeding individuals in 2011-2013. Amongst contemporary samples, d15N did not vary with sex or breeding site, but nestlings had lower d15N than adults. Over the past 100 years for both seasons and age classes, we found a significant decline in d15N, but no change in d13C. To test if the use of synthetic N fertilizer has changed environmental baselines, we also sampled d15N of 3 potential insect prey species and 3 non-aerial insectivore bird species. Neither prey, nor other bird species, showed any temporal trend in d15N, but our power to detect such a trend was limited by higher sample variance. These results support the hypothesis that aerial insectivore populations are declining due to

changes in abundance of higher trophic-level prey, but we caution that stable isotope studies of terrestrial food chains require additional tests of baseline change. Once addressed, the ability to decode the historical record locked inside museum collections has the potential to enhance our understanding of ecological change and inform conservation decisions.

A COMPARATIVE CASE STUDY IN SOCIAL VULNERABILITY SMALL-SCALE SEAGRASS FISHERIES IN THE PHILIPPINES

Angela Quiros, University of California Santa Cruz; Michael Beck, The Nature Conservancy

Tropical seagrass fisheries provide an important source of food and employment for coastal communities but small-scale fisheries in general, are declining. Vulnerability means high susceptibility to loss, and an inability to adapt. A community's social vulnerability results from pre-existing conditions likely to influence its response to changes in the fishing resource. In the face of worldwide seagrass decline, we need to assess how biological, ecological, and socio-economic conditions can affect fishing decisions, especially in situations when small-scale fisheries may alleviate social vulnerability. Using a place-based model of vulnerability, we characterized two Philippine fishing communities with similar seagrass and fish species composition. We used household, fisher, landing and underwater surveys to look for drivers that lead to vulnerability and qualitatively compared each community's context, sensitivity and adaptive capacity using natural capital, socioeconomic, and demographic indicators. We found differences in community social vulnerability and the vulnerability of individual groups based on the distance to urban centers, and the diversification of household and fisher income, and seagrass fishing gear and catch items. Catch items that comprised the greatest landing biomass did not have the highest market value. Women's participation in seagrass gleaning and fishing related activities enhanced both communities' adaptive capacity by providing additional food and income from this part-time fishing activity. Our research indicates that diversifying income sources, seagrass based catches, and workforces to include women, communities can decrease their sensitivity, enhance their adaptive capabilities, and ultimately reduce social vulnerability.

A CONTINENT-WIDE PARTICIPATORY STRATEGIC SITUATION ANALYSIS OF ECOSYSTEMS AND CONSERVATION

Stefan Kreft, Eberswalde University for Sustainable Development; Peter Hobson, Writtle College; Pierre Ibisch, Centre for Econics and Ecosystem Management, Eberswalde Univ.f.Sustain.Developm.

The 'peace dividend', result of the fall of the Iron Curtain, brought Europe two decades of relative optimism and increasing collaboration on all levels, from nations to groups (NGOs, companies) and individuals. This includes substantial advances in conservation policy, such as Natura 2000, the protected area complex stretching the EU. However, in the course of more widespread tendencies towards economical and political volatility, this continent is increasingly stricken by challenges such as societal polarisation, political extremism and disintegration and economical crises. In order to confront these challenges and continue being effective, the SCB Europe Policy Committee (PC-Europe) has set out to achieve the first ever analysis of the situation of European biodiversity and conservation that includes the root causes of conservation issues. In a series of online and physical consultations, the cumulative knowledge within PC-Europe is being systematised, documented and visualised. This 'knowledge mapping' is supported by the planning method MARISCO (Adaptive Management of vulnerability and Risk at Conservation sites; www.marisco.training). Expert knowledge is being complemented by inspection of literature (incl. maps), wherever deemed appropriate. Building on the resulting conceptual model of direct threats and root causes for deterioration of biodiversity in Europe, the group identifies existing problem-solving strategies, and systematically derives missing strategies. This allows for strategic prioritisation of future PC-Europe work. Learning a common 'planning language' also has the potential to help pre-empt potential dissent. The adaptive character of the tool used in this exercise will facilitate future updates and continuous learning. It is planned to seek to consolidate and diversify expertise by opening the exercise to interested fellow conservationists.

A FRAMEWORK TO EVALUATE THE EFFECTIVENESS OF NO-TAKE MARINE RESERVES

Juan Carlos Villaseñor-Derbez, Bren School of Environmental Science and Management; Caio Faro, Bren School of Environmental Science and Management; Christopher Costello, Bren School of Environmental Science and Management; Stuart Fulton, Comunidad y Biodiversidad A.C.; Jael Martínez, Bren School of Environmental Science and Management; Alvin Suarez, Comunidad y Biodiversidad A.C.; Jorge Torre, Comunidad y Biodiversidad A.C.; Melaina Wright, Bren School of Environmental Science and Managemen

Marine reserves are often implemented to preserve habitat and recover overfished stocks. In Mexico, recent regulations allow fishers to propose legally-recognized

no-take marine reserves, established by the fishery management agency (CONAPESCA) for a period of time. While the regulation includes instructions to request their implementation, no guidelines are provided for monitoring, evaluation, or renewal. Since 2012, 35 reserves have been implemented, often managed by the communities and supported by local NGOs. Yearly biological monitorings are conducted in reserves and their control sites. To date, the evaluation of the reserves relies solely on biological data, ignoring socioeconomic and governance dimensions. In absence of a standardized methodology, existing data is analyzed in different ways, hindering the ability to compare results across communities. We developed a framework to evaluate the effectiveness of the reserves by matching 7 commonly stated management objectives to a set of 9 biophysical, 5 socioeconomic, and 14 governance indicators. This framework includes a standardized survey to collect governance and socioeconomic data. Biophysical indicators are evaluated with a Difference-in-Difference analysis, estimating the net effect of the reserve through time. Linear regression models are fitted to socioeconomic indicators through time, testing for the difference in trends before and after the implementation of the reserve. Governance indicators are analyzed based on literature, identifying common governance structures and their associated effectiveness. To make the framework accessible to fishers and decision makers, and allow replication of results, we developed an open source application. The results produced by the application contain a report for a general audience, and a technical report that can inform the renewal and decision-making process.

A GLOBAL ASSESSMENT OF RECENT ENVIRONMENTAL CHANGE IMPACTS ON POPULATION TRENDS OF BIRDS AND MAMMALS

Fiona Spooner, UCL; Robin Freeman, Institute of Zoology; Richard Pearson, University College London

Species abundances are declining at an alarming rate; with vertebrate populations declining by 58% between 1970 and 2012. There are significant global threats driving these declines, habitat loss is known to be a primary driver of biodiversity loss and climate change is increasingly recognised as an important threat. Here we quantify the impact these threats have had upon bird and mammal population trends between 1950 and 2005 and use this to predict the impacts of future climate change on population trends. We extracted the annual rates of observed climate and land use change at the locations of 1,018 populations of birds (43.1%) and mammals (56.9%) over the period 1950-2005. For each population, we modelled the impact of land use change and climate change on population growth rates. The best performing models showed a strong association between rapidly warming climates and observed declines in population trends. This association was stronger in birds than mammals. We also found a significant interaction between land use change and climate change for mammal populations. However, despite using the best available global data we did not pick up a significant effect of land use change on its own, likely due to the coarseness of the land use data. Under the future climate scenario RCP 8.5, where heavy reliance on fossil fuels leads to a mean global temperature increase of 3.7oC by 2100, we can expect average population declines of 92.1% in birds and 62.3% mammals by 2100. No previous study has had the combined historical, spatial and taxonomic coverage of this study, allowing us to draw out generalizable trends on the impacts of recent anthropogenic environmental change on observed animal population trends. We have shown a strong association between the rates of climate change and population declines, suggesting that climate change poses a significant threat to species populations, if recent observed trends continue.

A JUST AND BLUE EARTH: SYSTEMATIC REVIEW FINDINGS LINKING FISHERY DECLINES AND SOCIAL INJUSTICES

Jessica Sparks, University of Denver

Marginalized, low-income nations disproportionately depend on marine resources. This socio-environmental vulnerability requires deft multi-disciplinary approaches to mitigate social injustices and marine sustainability challenges, including fishery declines. Unfortunately, some research and collaboration remain siloed within scientific branches, reinforced by publishing requirements. Different disciplinary science definitions may even exclude pertinent knowledge sources, particularly when considering the inclusion of marginalized populations in stakeholder engagement. Thus, critical research may be unknowingly ignored, difficult to access or not fully synthesized. This is particularly problematic when evaluating the complex feedback loops between fishery challenges and social impacts. Solutions informed by science that do not include the full spectrum of multi-disciplinary evidence have the potential to perpetuate social injustices. To synthesize literature across disciplines and scientific branches, we performed a systematic review, following a Campbell Collaboration Resource Center protocol, exploring how fishery declines exacerbate social injustices. We evaluated existing multi-disciplinary and discipline specific peer-reviewed literature, white papers, and dissertations/ theses (2000-15) in 16 repositories to identify hypotheses,

theoretical frameworks, and empirical evidence supporting linkages. We determined search terms and inclusion criteria a priori. The review yielded evidence on a spectrum of social injustices interfacing with declining fisheries, ranging from evidence-based connections (e.g., food security) to speculative connections (e.g., forced labor slavery). A lack of intervention and longitudinal studies and study replication diluted evidence-based connections, reinforcing hypotheses that multi-disciplinary research is difficult to access and integrate. Findings were synthesized to create an evidence map identifying research gaps and priorities.

A MIXED APPROACH BASED ON FIELD DATA AND REMOTE SENSING FOR THE AFRO-EURASIAN MIGRATORY BIRD FLYWAYS

Takuya Iwamura, Tel Aviv University; Yosef Kiat, Israel Bird Ringing Center, IBRC; Yotam Lenard, Jerusalem Bird Observatory, the Society for the Protection of Nature; Gidon Perlman, Jerusalem Bird Observatory, the Society for the Protection of Nature; Yaara Aharon-Rotman, Chinese Academy of Science, Beijing

Millions of migratory birds, many of them small passerines weighing less than 50g, fly through Israel during their annual migration between Eurasia and Africa. Although their population declines have prompted conservation efforts at their breeding grounds, an increasing number of studies suggest that conditions at their non-breeding sites ('wintering' grounds) in Africa are responsible for the shifts in migratory timing, which may result in mismatches with the seasonal reproductive cycles of prey species and a consequent lowered reproductive success. The failure to understand and address such threats in these African wintering grounds limits the extent of successful conservation efforts in the breeding grounds. Here, I applied cloud-based remote sensing technology (Google Earth Engine) to quantify the changes in environmental conditions as well as vegetation migratory songbirds' wintering grounds in Africa and compared these with the detailed data of their arrival timing in Israel. Israel constitutes a major 'bottleneck' of this migratory flyway, being the first stop-over site after the great migratory barriers (Sahara Desert and Red Sea) between Europe and Africa, and thus presenting an ideal opportunity to study these migrants. Employing geospatial statistics, I demonstrate that our current knowledge of habitat ranges is too sparse to enable robust conclusions, highlighting the need for a better understanding of these songbirds' wintering habitats. Finally, I demonstrate our on-going efforts in Israel to systematically collect isotopic signatures from feather samples of the migratory songbirds in order to better understand the locations of their African wintering grounds within the Afro-Eurasian flyways.

A NOVEL APPROACH TO TACKLE RESPIRATORY PATHOGENS RESPONSIBLE FOR GREAT APE POPULATION DECLINES

Livia Victoria Patrono, Robert Koch Institute; Sébastien Calvignac-Spencer, Robert Koch Institue; Fabian Leendertz, Robert Koch Institute

Human respiratory pathogens have caused lethal outbreaks in endangered great ape communities across Africa, highlighting the importance of strengthening preventive measures at the human-animal interface. The first step in establishing such measures is to build a solid knowledge on the microorganisms that are responsible for disease. Targeted genome capture and next generation sequencing pave the way to genomic insights on pathogen epidemiology, providing relevant information to reduce the risks of disease introduction to wildlife. The aim of this study was to develop a targeted genome capture strategy to thoroughly characterize viral and bacterial pathogens responsible for outbreaks of respiratory disease in a habituated chimpanzee community living in the Taï National Park. Isolates of human metapneumovirus (HMPV), respiratory syncytial virus (HRSV) and Streptococcus pneumoniae were used to generate capture baits encompassing full viral genomes and pneumococcal specific genes. Lung tissue from individuals that died of respiratory disease (n=10) was transformed into Illumina compatible libraries. For targeted capture, baits were allowed to hybridize to libraries for 48h. Enriched libraries were sequenced on a MiSeq platform. In preliminary experiments, reads mapping to HMPV and HRSV were captured in 5/10 samples. In two HRSV positive samples, we reconstructed nearly the full viral genome. Where only few reads were captured, these mapped to different parts of the genome, providing little but valuable information on different genes. Reads mapping to S. pneumoniae specific genes were captured in 6/10 samples, with an average coverage of at least 20X. The genome capture strategy developed herein is a promising tool to obtain greater information on human pathogens infecting great apes. Tailoring this method to non-invasive samples (e.g., feces) will expand its applicability to most primatology sites, thus significantly impacting our knowledge on respiratory disease ecology.

A PAN-NEOTROPICAL ANALYSIS OF HUNTING PREFERENCES

Ciara Stafford, University of Manchester; Richard Preziosi, Manchester Metropolitan University; William Sellers, University of Manchester

Hunting in the neotropics is a widespread form of resource extraction. However, there is increasing concern that current activities are leading to the decline and extirpation of vulnerable species; particulary ateline primates, large ungulates (such as tapirs and white-lipped peccaries) and large birds such as curassows. Hunting patterns are expected to be a product of two principal influences: the value of return for a given amount of effort invested into hunting, and cultural factors that determine the prestige and usefulness of prey. Previous work has suggested that profiles change in a predictable way over time, becoming more diverse and more dependent on smaller bodied species as preferred prey become scarcer. We evaluate the hunting profiles of 78 neotropical communities of Central and South America, investigating the uniformity of species preferences, whether communities that are geographically closer have similar hunting profiles, and whether the age and size of settlements can be used to predict the type and diversity of species targeted. We found that there was only weak correlation between the structure of communities' hunting profiles and their geographical proximity. Neither a community's size or age was a good predictor of the shape and structure of its hunting profile. Our data suggest that either the availability of prey or the cultural influences dictating the value of different species can change rapidly over small distances, and that older and larger settlements do not impact prey species distributions in a predictable way. Our research has important implications for the use of commonly used proxies for hunting pressure such as the age and size of communities, and suggests that broad-scale approaches to promoting sustainable harvests may not adequately address variation in cultural preferences.

A RAPID ACOUSTIC ASSESSMENT IDENTIFIES A UNIQUE FAUNA IN MADAGASCAR

Orlando Acevedo-Charry, GOUN; T. Mitchell Aide, Sieve Analytics Inc, University of Puerto Rico-Rio Piedras; Dina Andrianoely, Centre ValBio; Claude Ralazampirenena, Centre ValBio; Patricia Wright, Icte

Madagascar is a biodiversity hotspot, but continued deforestation is threatening many remnant forest stands. A recent expedition "discovered" an isolated forest stand, the Ivohibory Forest (~8 km2), in the south-central plateau. The Ivohibory Forest occurs between tropical wet forest to the east and tropical dry forest to the west, which could result in an interesting combination of flora and fauna. We conducted a rapid assessment of the acoustically active species (e.g., insects, amphibians, birds, and mammals) using passive acoustic monitoring devices in 20 sites at the beginning of the rainy season in December 2016. We collected >9,000 1-minute recordings from these sites, and used them to create soundscapes, evaluate the proportion of acoustic space used, and to identify the major sources of biotic sounds. Insects dominated the soundscapes, followed by amphibians, birds, and mammals. Insects were identified to morph-acoustic species, while the majority of amphibians, birds, and mammals were identified to species. Species from both dry and wet forest biomes were identified, suggesting that the Ivohibory Forest has a unique species composition and is an important regional refugium. In addition, we identified a threatened lemur species (*Lemur catta*), and possibly a new lemur species (*Cheirogaleus sp*.) and a new frog species (*Mantidactylus sp*.). The combination of a unique fauna, and threatened and possibly new species require urgent action to conserve and expand research in the Ivohibory Forest.

A SOCIAL INFLUENCE INTERVENTION: ENHANCING RESIDENT COOPERATION TO COMBAT INVASIVE SPECIES

Rebecca Niemiec, Stanford University Emmett Interdiscplinary Program in Environment and Resources; Robb Willer, Stanford University; Nicole Ardoin, Stanford University; Frances Kinslow Brewer, Big Island Invasive Species Commitee Pacific Cooperative Studies Unit

Engaging residents in invasive species control on private lands is often an effective strategy to reduce the spread of invasive species. Motivating resident engagement in control efforts, however, is particularly challenging because invasive species control on private lands poses a collective action problem. In particular, people's actions on their property make little difference to invader populations unless a sufficient number of neighboring residents also engage in control. To achieve widespread reductions in invader populations, therefore, residents must participate in collective behaviors, such as applying normative pressure to neighbors regarding control and sharing information about control tactics. Although social-psychological studies have provided insight into the factors that may motivate participation in collective action, researchers have rarely applied those insights to invasive species control. In this study, we developed and evaluated the effectiveness of an approach that builds on social-psychological theory to enhance neighbor engagement in collective behaviors to control the invasive little fire ant (*Wasmannia auropunctata*). We delivered this approach using resident workshops to 5 communities in Hawai'i and compared the effectiveness of our approach at enhancing resident collective behavior with a more traditionally used "knowledge-transfer" approach. To measure changes in social perceptions and behaviors, we used pre- and 2 and 7-month post-workshop surveys for 92 participants. We found evidence that resident engagement in collective behaviors increased in communities where we

used the social influence approach compared with the knowledge-transfer approach, in part because of residents' increased perceptions of social norms and community reciprocity regarding control efforts. Our findings provide experimental evidence that applying theories on the social psychology of collective action can enhance resident engagement in conservation efforts.

A SYNTHESIS ON CORAL REEF RESTORATION EFFORTS

Elisa Bayraktarov, The University of Queensland; Catherine Lovelock, The University of Queensland; Hugh Possingham, The University of Queensland; Megan Saunders, The University of Queensland; Kerrie Wilson, The University of Queensland

Collaborative synthesis research can help distill existing ideas, data, and methods from multiple fields to advance solutions for global-scale environmental issues such as the degradation of important coastal and marine habitats. These habitats are suffering from existing stressors such as climate change, coastal development, pollution, and over-fishing. While the current paradigm of effective conservation advocates protecting habitat over restoration efforts, some areas may not have enough intact habitat left to protect. This is where restoration, or assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed, becomes critical. However, decisions on whether, what, how, where, and how much to restore are often impeded by the lack of information about restoration cost and success. Here, we synthesize data from the restoration literature to evaluate restoration cost, survival of restored organisms, project duration, area, and techniques which have been employed on coral reefs around the world. Findings showed that restoration cost had an overall global median of 165,607 US$ ha-1 (2010 US$) while this value grouped by techniques applied ranged between 7,647 and 56,163 US$ ha-1 e.g., for the coral gardening approach. Restoration projects were mostly short-lived (one year), happened over small-experimental scales (0.0035 ha), and reported 64.5% as median survival of restored corals. We further identify the proportion of published studies that had clearly defined restoration goals/objectives, measurable metrics of success and whether these were aligned with the restoration outcome. Finally, we discuss what is lacking for coral reef restoration to be 1) effective, 2) efficient, and 3) engaging. The current challenge for coral reef restoration is to scale-up restoration efforts to meaningful ecological, social and economic scales and ensure restored ecosystems are resilient to anthropogenic climate change.

ADAPTIVE MANAGEMENT OF DWINDLING HERDS OF ARCTIC CARIBOU UNDER CLIMATE CHANGE

Per Fauchald, Norwegian Institute for Nature Research; Vera Hausner, UiT - Arctic University of Norway

The indigenous people of the Arctic depend on fluctuating and migrating wildlife populations for subsistence. Traditionally, in this unique "bottom-up"-regulated system the hunters and fishers have little impact on the resource level, and have coped with fluctuating resource availability through a range of adaptations. Climate warming is however currently threatening many Arctic wildlife populations, including the large herds of migrating tundra caribou in North America. Management boards have advocated an adaptive "traffic-light" management regime, in which the hunting restrictions are adjusted according to the status of the caribou population. We combined caribou population data with data from community based subsistence harvest surveys to investigate how local hunters have responded to fluctuations in the caribou populations. The data span caribou populations and indigenous settlements across North America in the last 45 years. Circle regression showed that the proportion of caribou in the harvest has closely followed the fluctuations in the caribou herds with no evident time lags. The percentage of caribou in the harvest was less than 20% during the cyclic low phases and increased to about 60% during the peak phases. Our analyses indicate that expansion and retraction of the ranges following the population fluctuations was an important factor explaining the harvest of caribou. We suggest that natural variability in caribou ranges counteract unsustainable harvest of the populations and adaptive management using traffic-light approaches should take these spatial issues into consideration.

AFRICAN HOUBARA BUSTARD RESTORATION PROGRAM A HOLISTIC CONSERVATION STRATEGY

Yves Hingrat, Reneco International Wildlife Consultants

A holistic conservation strategy allows wildlife restoration through a rational use of natural resources and the promotion of sustainable human activities. After decades of decline primarily due to uncontrolled hunting, the African Houbara (*Chlamydotis undulata*) populations are now rising up in Morocco thanks to the holistic conservation strategy implemented by the International Fund for Houbara Conservation. The strategy aimed to restore Houbara populations, conciliating maintaining a cultural heritage (falconry), stepping up human livelihood, knowledge and education. In 20 years, ex and in-situ

conservation measures based on sounds applied and fundamental researches (472 communications and 71 students) have been made possible with the support of hunters and Moroccan authorities. Thanks to this long-term commitment a conservation breeding is securing the genetic diversity of the species and produces annually more than 15 000 birds for the reinforcement of wild populations in a network of hunted and protected areas of 75 000 km2. In conjunction with effective protection measures (surveillance network, hunting regulation and public awareness), the overall density of houbara in Eastern Morocco has been multiplied by ten and is about 0.5 ind/km2, allowing the viability of wild populations. This accomplishment is the work of a 1 000 of local employees annually and a network of international collaborators. In order to maintain gathering all stakeholders around the valorisation of a natural resource, the houbara, the IFHC is now preparing to face the upcoming challenges of climate and land use changes. The long-term research as the monitoring of about 3 500 tagged individuals over 20 years showed important variations in annual survival probabilities, while Species Distribution Models predict a species range shift in the coming decades. The viability of the African Houbara relies on extending the holistic conservation strategy at the scale of its current and future range

AGROFORESTRY VS. CLIMATE CHANGE: THE CASE OF COFFEE AND CONSERVATION

Robert Rice, Smithsonian Conservation Biology Institute

Coffee lands blanket more than 10 million hectares worldwide between the tropics, with considerable overlap with biodiversity hotspots. Central and South America account for 55% of global production, and management practices range from highly "technified", full-sun systems to densely shaded traditional settings. Coffee with a diverse shade component has been shown to provide viable, quality habitat for a range of taxa, revealing that certain managed lands can play a role in conservation. As climate-change forces gain momentum, however, reports from producers and coffee researchers portend a range of challenges facing this crop that ranks second only to oil in terms of exports from the developing world. The recent Australian Climate Institute's report, "A Brewing Storm", cites a number of impacts from which coffee currently suffers, predicting that suitable coffee area globally may decrease by half by 2050, with production shifting away from the equator and/or to higher elevations along mountain slopes. Altered temperature and precipitation patterns are stressing coffee farms in what historically have been important production origins. Pests and diseases in areas heretofore unaffected now pose problems to growers. And the forecast of stronger, later-season hurricanes in certain regions adds another challenge from global warming. Relocating coffee production "up-mountain" will certainly have conservation impacts where new coffee areas encroach into forests and biodiversity hotspots. However, evidence from a number of research angles points to shade coffee (agroforestry) systems as a likely solution to some of these problems. The microclimate and biodiversity found in coffee agroforestry systems may provide viable barriers to these climate-change threats. Preserving existing agroforestry systems and creating new ones when and where possible may be key to long term conservation efforts in managed lands.

AMENITY DEMAND VERSUS SPECIES CONSERVATION IN INDIAN ZOOS

David Martin, Davidson College; Cassidy Shell, Davidson College

We explore whether the amenity demand for a zoo affects the diversity of the species in its collection? We know that the demand for visiting zoos increases as the number of nearby residents and their wealth increases. Further, since people visit zoos to view certain attractive species, zoos tend to match their collections to those preferences. Given India's urbanization, that amenity demand could encourage Indian zoos to focus their collections on attractive species. However, India's National Zoo Policy encourages zoos to prioritize endangered species in their collection with the species preference to be (first) locality, region, country and finally other areas. A priori it is possible that increasing amenity demand would encourage zoos to narrow or to diversify their collections. If visitors support the National Zoo Policy, there would be diversity between zoos as their collections match their localities. Or, if visitors expect to see species from all ecosystems in the one zoo they visit then the between zoo collection diversity might narrow. Similarly, the within zoo collection might be broad to educate about the need for local resource conservation and ecological balance. Or, the demand for viewing only the attractive species in the local ecosystem argues for a narrow within zoo collection diversity. Given that uncertainty, we empirically explore the role of amenity demand on the between-zoo and within-zoo diversity of zoos' collections. We use the Central Zoo Authority of India's database for 2011 to calculate the alpha (within zoo) diversity and the beta (between zoo) diversity for each of the 30 listed zoos. These are our dependent variables in two regression functions of amenity demand. For independent variables we use the cities' population and wealth (vehicles per household) from the 2011 decennial census. We use Seemingly Unrelated

Regression estimation because each zoo's alpha and beta diversities are likely related.

AN ALLOMETRIC APPROACH TO ESTIMATE PLANT SPECIES EXTINCTION VULNERABILITY

Melinda De Jonge, Radboud University Nijmegen; A. Jan Hendriks, Radboud University Nijmegen; Jelle Hilbers, Radboud University Nijmegen; Mark Huijbregts, Radboud University Nijmegen; Eelke Jongejans, Radboud University Nijmegen; Wim Ozinga, Alterra - Vegetation, Forest and Landscape Ecology

For effective conservation of biodiversity, it is important to promptly identify populations most vulnerable to extinction. Extinction risk can be assessed using Population Viability Analysis, however this approach requires large amounts of demographic data. For birds and mammals, species traits, such as body size, have been successfully used as proxies of extinction vulnerability. Allometric theory predicts that many demographic parameters are related to body size through the scaling of metabolic rates. To our knowledge, the relationship between size and extinction vulnerability has never been assessed for plants. The goal of this study was to investigate the role of plant height on the intrinsic vulnerability of plant species to extinction. We quantified relationships between plant height and the intrinsic rate of population increase, carrying capacity, initial population size and variance in population growth rate due to environmental stochasticity. These relationships were used to calculate the intrinsic mean time to extinction and probability of extinction plants as a function of plant height. Additionally, we performed an uncertainty and sensitivity analysis to reveal the relative importance of the demographic parameters in determining the vulnerability of to extinction. The vulnerability of plants to extinction was found to be most sensitive to fluctuations in the population growth rate due to environmental stochasticity. We found large plant species to be less susceptible to environmental stochasticity, and as a result less vulnerable to extinction than small species. These results increase our theoretical understanding on the relationship between life history traits and demographic rates in plants, and consequently, their intrinsic vulnerability to extinction. Our results can be used to obtain first estimates of the extinction vulnerability of data-deficient populations or to prioritize conservation efforts among species under equal external pressures.

AN EVALUATION OF AN INCENTIVE-BASED WATERSHED CONSERVATION PROGRAM USING A RANDOMIZED CONTROL TRIAL

Edwin Pynegar, Bangor University; Nigel Asquith, Fundación Natura Bolivia; James Gibbons, Bangor University; Julia Jones, Bangor University

Despite the spread of incentive-based conservation interventions such as Payments for Ecosystem Services around the world, their effectiveness remains unclear, as robust impact evaluation of conservation interventions is challenging and rare. We used a pioneering Randomised Control Trial (RCT) method to evaluate impact of the Watershared incentive-based conservation program in the Bolivian Andes. The program aimed to deliver improvements in water quality (as measured by Escherichia coli concentration) by incentivizing landowners to avoid forest clearance and exclude cattle from riparian forests. Baseline data was collected in 2010 in 129 communities, which were then randomly allocated to a treatment group which was offered the Watershared program, or to a control group which was not. Endline data was collected in 2015. We found no significant difference in water quality between communities belonging to treatment and control groups, once the baseline data was taken into account. Despite this, presence of cattle faeces was found to significantly reduce water quality, meaning that while the intervention action itself can have an effect, it did not do so at the landscape scale. This may be because landowners do not enrol the most important land from a water quality perspective (at endline we found only 14 out of 65 community water intakes to be located within an enrolled area), nor do they enrol sufficient areas to achieve desired changes in outcomes of interest. This demonstrates how effective Payments for Ecosystem Services and other incentive-based conservation programs must be designed carefully to capture the biophysical linkages between the incentivized land use and the desired ecosystem service in the context of that landscape. Additionally, this example demonstrates RCTs' potential in conducting high-quality conservation impact evaluations, and thereby contributing to the evidence base available to policy-makers in making better-informed conservation decisions.

AN EVALUATION OF MARINE IMPORTANT BIRD AND BIODIVERSITY AREAS IN SPATIAL CONSERVATION

Jennifer Mcgowan, The University of Queensland; Rohan Clarke, Monash University; Moreno Di Marco, The University of Queensland; Hugh Possingham, The University of Queensland; Bob Smith, DICE, University of Kent

Important Bird and Biodiversity Areas (IBAs) are sites identified as globally important for bird species conservation. Marine IBAs are one of the few multi-species datasets globally available for the marine environment, and their use in conservation planning is likely to increase as countries aim to protect 10% of their territorial waters. We tested 15 planning scenarios for Australia's Exclusive Economic Zone to guide best practice on integrating marine IBAs into spatial conservation prioritization. We found conservation plans based solely on IBAs failed to meet basic levels of marine habitat representation, and plans based solely on habitat protection similarly failed to protect IBAs. Further, treating marine IBAs as totally irreplaceable sites produced the most inefficient plans in terms of ecological representativeness and protection equality. Our results demonstrate that spatial conservation prioritizations based on broad biodiversity surrogates (such as habitat types) and sites defined as important for biodiversity (such as IBAs), have the highest representation and cost-efficiency when flat targets are applied. We believe these findings are relevant to other criteria-based approaches, such as Key Biodiversity Areas (KBAs) and Ecologically or Biologically Significant Areas (EBSAs), where sites are delineated with the intent of influencing global conservation priority-setting.

AN IMPACT BASED PRIORITIZATION OF FERAL PIG MANAGEMENT

Jeremy Ringma, The University of Hawaii; Melissa Price, University of Hawaii

Introduced feral pigs (*Sus scrofa*) are among the world's worse invasive species, disturbing native vegetation and spreading invasive weeds. Exclusion fencing has become a popular method for protecting sensitive habitat from pig disturbance, but at a cost of up to $150,000 per kilometer, pig exclusion fencing is among the most expensive forms of conservation fencing globally. A large, ad-hoc network of exclusion fences has rapidly expanded in the Hawaiian Islands to protect high priority watersheds from pig disturbance. However, the extent of fencing in Hawaii is limited by their high cost and social pressure to maintain pig populations for hunting purposes. Like most ad-hoc networks such as those seen in other fencing networks and protected areas, the Hawaiian fencing network is less efficient at meeting conservation objectives than a systematically prioritized network. With a further 100,000 acres of fenced areas planned by 2030, a systematic prioritization of optimal fencing locations is needed to address the existing inefficiencies. Unlike other prioritisations which focus solely on spatial representation, our process identifies priority areas based on the expected differential return of fencing at preserving biodiversity based on the modeled impact of disturbance. We created a prioritization of future pig exclusion fencing in Hawaii which maximizes threatened species coverage while maintaining watershed recharge objectives and promoting hunting opportunities. The prioritization improved threatened species outcomes within ungulate exclusion fencing, while decreasing the projected costs associated with fence construction.

AN OVERVIEW OF THE ETHNOPRIMATOLOGY OF THE TIKUNAS AT THE COLOMBIAN-PERUVIAN AMAZONIAN BORDER

Angela Maldonado, Fundacion Entropika; Thomas Lafon, Fundacion Entropika

Hunting primates has been an important cultural and social activity for the Tikunas of the Colombian-Peruvian Amazon. In the recent past, tribal laws laid down constraints, in the form of hunting and food taboos, which enabled indigenous people to manage their prey base. However, the loss of cultural restrictions, intrinsically linked with their religion and traditional knowledge, has meant that previously taboo species are now being hunted and consumed, gradually depleting primate populations locally. For instance, the trapping of live night monkeys (*Aotus spp*.) for malaria research, a traditionally taboo species for Tikuna indigenous people, has today become a source of income. The main challenge in implementing community-based conservation interventions is that the income resulting from protecting biodiversity does not ensure an appropriate monetary return for local people. We here present information on the conservation status of *Aotus nancymaae* and *Aotus vociferans* using data on population assessment. Census fieldwork was conducted from May 2009 to April 2015 at ten sampling sites exposed to different harvest levels. We present contrasting results on densities between Colombia and Peru (46 ind/km2 and 17 ind/km2, respectively), suggesting an impact on Peruvian populations due to over-extraction. Moreover, we explore the possibility of how research and sustainable economic alternatives such as primate-watching can prove to be a way to replace income from the over-exploitation of wildlife, while improving local living standards and perceptions on primates. We conclude with the proposal of a bi-national strategy that includes a management plan for the genus Aotus, as flagship species of this conservation initiative, and the follow up of CITES legislation at the border area.

APPLYING NEXT GEN SEQUENCING TO CONSERVATION OF CRITICALLY ENDANGERED CARIBBEAN ACROPORIDS

Kayla Ripple, Coral Restoration Foundation; Jessica Levy, Coral Restoration Foundation; Ken Nedimyer, Coral Restoration Foundation; Steve Vollmer, Northeastern University; R Winters, Coral Restoration Foundation

Once abundant on Caribbean reefs, *Acropora cervicornis* and *A. palmata* have declined in abundance (>98% at some locations) since the early 1970's and are listed as "threatened" and "critically endangered" under the U.S. Endangered Species Act and IUCN Red List respectively. Coral population enhancement efforts (referred to here as coral restoration efforts) currently taking place provide local solutions for aiding reef recovery when corals are strategically restored at appropriate densities. Variable responses of corals to the environment have been recorded at restoration sites and in nurseries, yet the contribution of genetic make-up is still unclear in its influence on long-term success of Acropora at these sites. Incorporating conservation genetics into the recovery plan of a threatened or endangered species is not a novel concept. Existing coral restoration practices often incorporate principles of genetic diversity through wild collections of putatively unique genotypes, which are propagated in open ocean, in situ nurseries, then relocated to designated restoration sites. Simply increasing the number of genotypes placed on reefs may not afford the long-term recovery of the species, as relatedness of the genotypes should also be considered for a truer representation of genetic diversity to promote resiliency of the population in the face of variable environmental factors and a changing climate. Here, we present a study that was conducted to analyze the relatedness of over 200 putative Acropora genotypes currently held in South Florida in situ coral nurseries and its applications to enhance restoration efforts. Information is archived as a publicly-accessible Acropora Reference Index (ARI) with genetic and phenotypic data for all Acropora genotypes that can be shared amongst scientists, managers, and restoration practitioners to inform restoration strategies for the recovery and conservation of the species throughout the Florida Keys and Caribbean.

ARE HERBIVOROUS REEF FISHES FUNCTIONALLY SIMILAR? INSIGHTS FROM COMPOUND-SPECIFIC ISOTOPE ANALYSIS

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Herbivorous coral reef fishes play important roles in helping to structure their environment directly by consuming algae and indirectly by promoting coral health and growth. These fishes are generally separated into three broad functional groups: browsers, grazers, and excavators/scrapers, with these groupings often thought to have a highly similar ecological role. This categorization assumes a high level of functional redundancy within herbivorous fishes. However, recent evidence questions the use of this broad classification scheme, and posits that there may actually be more resource partitioning within these functional groups. Here, we use a compound-specific stable isotope approach (CSIA) to show this appears to be true, with a greater diversity of functional roles than generally assumed found within broad functional groups. The Ψ3C signatures from essential amino acids of reef end-members (coral, macroalgae, detritus, and phytoplankton) and fish muscle were analyzed to investigate differences in resource use between fishes. Most end-members displayed clear isotopic differences; most fishes within functional groups were dissimilar in their isotopic signature, implying differences in the resources they target. No grazers closely resembled each other isotopically, implying a much lower level of functional redundancy within this group; scraping parrotfish were also distinct from excavating parrotfish and to a lesser degree distinct between scrapers. This study highlights the potential of CSIA to help distinguish fine-scale ecological differences within feeding guilds of reef organisms as well. These results question the utility of lumping nominally herbivorous fishes into broad functional groups with assumed similar roles. Given the apparent functional differences between nominally herbivorous reef fishes, it is important for managers to consider the diversity of ecological roles each of these fishes play as important parts of productive coral reef ecosystems.

ARE SEA OTTERS THE SOLUTION FOR COASTAL RESTORATION IN THE NORTHEAST PACIFIC?

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In many systems, it has now been established that predators can indirectly control plant communities via trophic cascades and that predator re-introduction following local extinctions can promote the recovery of ecosystems and their functioning. The recovery of sea

otters in the north Pacific is a prime example of how the conservation of top predators can lead to range expansion into perceived "novel" habitats, with unexpected benefits to threatened ecosystems. The return of this keystone predator to estuaries may have important implications for estuarine food webs and habitats. Here we focus on one imperiled California estuary, Elkhorn Slough, which suffers from nearly a century of human degradation and examine a suite of ecosystem functions that have benefitted from sea otter recolonization. We find through their consumption of crabs, sea otters are capable of: 1) restoring seagrasses threatened from extreme nutrient loading, 2) protecting valuable salt marshes that are eroding into the sea, and 3) providing invasion resistance by removing non-native crabs from their previous strongholds. However, like many other recovering top predator species, certain conflicts can arise from sea otter recovery through competition with humans for coastal resources. Through the lens of ecosystem functioning we can get an insight as to how sea otters influenced estuaries in the past and how they might be able to help restore degraded California estuaries as they expand, while also informing managers on the trade-offs of sea otter recovery. This research highlights the importance of restored top-predator populations and food-webs in providing ecosystem resilience and presents new conservation challenges in the 21st century.

ASKING QUESTIONS FOR COMPLIANCE MONITORING INSIGHTS FROM ARTISANAL FISHERS IN NICARAGUA

Mark Gibson, Michigan State University; Meredith Gore, Michigan State University

Direct questioning is one of the primary ways that data may be collected for the assessment and evaluation of legal compliance. Case studies using direct questioning for compliance monitoring among natural resource users tend to illustrate and develop quantitative survey methods over qualitative interviewing because of the overwhelming assumption that non-compliance is a highly-clandestine behavior. We explored the extent to which qualitative methods can offer simple and reliable baseline compliance assessments. We conducted two case studies using key informant interviewing among participants (n~60) actively fishing for green turtle and Caribbean spiny lobster along the southern Atlantic coast of Nicaragua in July-August 2015. Our objectives were to explore fishers' perceptions of the occurrence and causes of non-compliance and their opinions of management. We employed bias mitigation techniques—researcher independence, participant confidentiality, projective questioning, and responsive interviewing—to reduce response and non-response bias. Results suggested potentially-widespread non-compliance problems in both fisheries. A majority of turtle fishers (31 of 41 fishers) provided self-reports and perception reports suggesting that most fishers are active during the closed season, and that this was due to a lack of navy enforcement and their misunderstanding of the fishing regulations. Lobster fishers in a major fishing area also reported that they themselves do not hold the required fishing licenses (7 of 9 fishers) and that this relates to a lack of government inspections and municipal licensing services. Results suggest that assumptions about the inability of qualitative interviewing to assess non-compliance can be challenged, and the technique may be used as a cost-effective way to both inform management policy and identify meaningful concepts and hypotheses for more quantitative social surveys.

ASSESSING THE ASSESSMENTS: EVALUATION OF FOUR IMPACT ASSESSMENT PROTOCOLS FOR INVASIVE ALIEN SPECIES

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Invasive alien species (IAS) are one of the greatest threats to biodiversity and represent a globally significant and rapidly growing economic cost. Effective policy and management responses to the multiple threats posed by IAS are thus essential. Such responses rely on the ability to assess IAS impacts before conclusive empirical evidence is available. A wealth of different IAS risk and/or impact assessment protocols are available, but lack of comparability, transparency and repeatability in the way these assessments are carried out is a major impediment to good decision-making. Here, we present the first in-depth assessment of the consistency among the impacts estimated from four prominent generic protocols for assessing IAS impacts (EICAT, GISS, Harmonia+ and NNRA), using two conspicuous non-native parrot species found in Europe: the widespread ring-necked parakeet (*Psittacula krameri*) and the rapidly spreading monk parakeet (*Myiopsitta monachus*). We also assess how elicitation procedures affect the impact assessment process and outcome. Our findings show that the procedures used to assess impacts may influence assessment outcomes. We find that robust IAS prioritization can be obtained by assessing species based on their most severe documented impacts, since all protocols yield consistent outcomes across impact categories. Additive impact scoring offers complementary, more subtle information that may be especially relevant for guiding management decisions regarding already established invasive alien species. Such

management decisions will also strongly benefit from consensus approaches that reduce disagreement between experts. We also demonstrate how the structure of the impact assessment protocol can improve the consistency of assessment outcomes. We show several approaches for improving the uptake of scientific advice into decision-making. This is fundamental for efficient allocation of conservation resources and to broaden stakeholder support.

ASSESSING THE AVOIDED DEFORESTATION EFFECTS OF PROTECTED AREA MOSAICS IN THE AMAZON

Melissa Arias, Yale University - University of Sao Paulo

Established in the year 2000 by the Brazilian National System of Conservation Units Law, Protected Area Mosaics (PAMs) aim to harmonize the management of multiple protected areas (PAs) that belong to the same or different conservation category, and that are in close proximity of one another. By grouping multiple PAs together, PAMs seek to enhance the presence of biodiversity through improved connectivity, while simultaneously promoting sustainable development at a regional context. Since 2000, more than 15 federal PAMs have been officially recognized by the Brazilian Government, of which three are located in the Amazon. Together, these Amazon PAMs represent 59 PAs and cover an area of approximately 271,035 km2, an extension larger than New Zealand. Because of the growing interest in establishing PAMs as a way to strengthen PA management and support conservation, it is important to assess whether current PAMs are being effective at achieving their mission. Therefore, this study seeks to examine PAM effectiveness, by focusing on their potential to avoid deforestation in the Brazilian Amazon. Given that both PAs and PAMs are not randomly assigned, determining their effects on deforestation requires the application of statistical tools that estimate the counterfactual, or what would have happened if there had been no intervention. Here, we construct a panel dataset of deforestation time-series from 2001 to 2016, including multiple covariates that relate to our response variable (deforestation) and to the treatment assignment mechanism (processes leading to PAMs establishment). We then apply four difference-in-difference models with the purpose of comparing PAM effects under different assumptions and control groups, using matching to pre-process our data. Through these methods, we seek to gain an insight on whether scaling up towards a more centralized PA governance strategy has a positive conservation effect in addition to the benefits of establishing PA on their own.

ASSESSING THE MULTI-GEAR AND MULTI-SPECIES ARTISANAL FISHERIES OF THE COLOMBIAN PACIFIC

Pilar Herron, Ecomares Foundation; Juan Manuel Diaz-Merlano, Fundacion MarViva; Giovanni Melo, Fundacion MarViva; Matthias Wolff, Leibniz Center for Tropical Marine Research

Small-scale fisheries in the Colombian Pacific provide food security, income and employment to more than 11.000 afro-descendant families. With nearly 300 species caught and at least 20 fishing gear variations, the multi-species and multi-gear nature of the fisheries poses particular hurdles for their management. Traditional fisheries management measures, such as catch quotas and size limits, have proven difficult to enforce and are currently being challenged as appropriate measures for sustainable fisheries. "Input-control" measures, whereby the fishing effort is regulated, could be more appropriate, but a deeper understanding is needed of the potential ecological and socio-economic impacts of such measures, for example, restricting or replacing a fishing gear. Here we present an on-going research project that is gathering data on catch composition, fishing effort and socio-economic aspects of artisanal fisheries – with emphasis on potential gear differences - at coastal communities located in two contrasting sub-regions of the Pacific coast. The aim is to provide resource users and decision makers with information on: current stock condition of main target species, species and size composition of different fishing gears and socio-economic trade-offs for fishers using different gears. Preliminary results show that a high proportion of fishes of some target species are caught under their size of maturity, although such proportion varies among fishing gears. Differences on the species composition and trophic level of the catch of different gears are also shown, which are probably related to the different habitats and depth of fishing grounds used by fishers. These preliminary results indicate that caution should be taken with gear-based management measures, since they could lead to unexpected and undesired outcomes.

ASSESSING THE POTENTIAL OF HUMAN CONSUMPTION TO REDUCE THE THREAT OF INVASIVE LIONFISH IN BELIZE

Jennifer Solomon, Colorado State University; Jennifer Chapman, Blue Ventures; Marc Fruitema, Blue Ventures; Philip Krening, Colorado State University; Julie Sabattis, Colorado State University

Pacific red lionfish (*Pterois volitans*) were first reported in Belize in 2008, and have since invaded reefs nationwide,

causing grave concerns about deleterious impacts on the Belize Barrier Reef, as well as on the fishing and tourism industries that form the core of the nation's economy. Although a growing body of research exists on the ecological impacts of the lionfish invasion, little work has been done on the human dimensions of lionfish management. In Belize, development of a lionfish market is proposed as the most promising way to control the invasion. However, the barriers against and supports for creating such a market are poorly understood. We present findings from standardized surveys of the Belizean public (n=400) and foreign tourists (n= 386) designed to understand the potential of human consumption as a management strategy. Discussing results in the context of the diffusion of innovation theory, we find that Belize possesses a critical mass of Belizean lionfish consumers (15%) who can act as key informants in increasing lionfish consumption locally. However, there exist notable obstacles to reliable Belizean lionfish consumption, including market competition and misinformation. Tourists and Belizeans expressed a willingness to consume lionfish, indicating that access to fish alone may be a critical barrier to address. We also explored barriers and opportunities for hunting lionfish through semi-structured interviews (n=46) with fishermen, a barrier ranking exercise and seasonal calendars. Major barriers were found to be market-based, rather than knowledge-driven. We suggest interventions aimed at increasing lionfish catch in Belize, including segmentation for social marketing campaigns, and outreach to tackle misinformation, and explore potential for a supplemental market for lionfish. Similar approaches to human dimensions research are needed across the range of the invasive lionfish to increase the potential for controlling impacts on biodiversity.

ASSESSMENT OF THE AGGREGATE CONSERVATION EFFORT OF UNITED STATES NGOS

Rossana Merizalde, IUCN; Thomas Brooks, IUCN; Deborah Good, IUCN US; Frank Hawkins, IUCN US; Paul Salaman, Rainforest Trust

The International Union for Conservation of Nature (IUCN) is mandated to operate according to "One Programme" across its Secretariat, independent expert Commissions, government and non-governmental organization (NGO) Members. This Programme reflects the IUCN's mission and enables the capacities of the Union's constituent parts to deliver conservation results in an effective and collaborative way through involvement and joint actions. However, no robust mechanisms yet exist to document Member contributions towards the Union's Quadrennial Programme. We reviewed the Charity Navigator database and individual organisation websites to compile data on i) operating budgets, ii) programmatic budgets, and iii) memberships of those environmental NGOs in the US that are IUCN Members. Operating budgets are used to determine IUCN Membership fees, but are dwarfed by the ten-figure aggregate programme budget of the 115 IUCN Member NGOs in the US. If properly documented, this would likely represent a very large contribution towards the IUCN "One Programme". These organisations also represent membership of many millions of individual citizens, a powerful voice for nature. We then used the Charity navigator search criteria for "Environment" (419 organisations), "Wildlife Conservation" (93) and "Zoos and Aquariums" (72) to assess the operating and programmatic budgets of US environmental NGOs that are not currently IUCN Members. If these organisations were to join IUCN, both the Membership revenue to IUCN and the potential leverage of contributions to the "One Programme" could be more than doubled. The establishment of the IUCN US National Committee in 2016 could provide a platform to better document the aggregate contributions of conservation efforts across US NGOs and to expand IUCN's Membership among this constituency.

ASSESSMENT OF THE VULNERABILITY OF FRESHWATER CRAYFISH TO CLIMATE CHANGE

Md Anwar Hossain, The University of Melbourne; Lucie Bland, The University of Melbourne; Monika Bohm, Institute of Zoology, Zoological Society of London; Mark Burgman, The University of Melbourne; José Lahoz-Monfort, The University of Melbourne

Climate change is emerging as one of the major threatening processes to the persistence of biodiversity on earth. Global assessments of climate change vulnerability highlight the most climate-vulnerable species and geographic regions and can promote effective conservation actions. Yet the majority of climate change vulnerability assessments (CCVA) have focused on terrestrial and marine species, and largely ignored freshwater species and invertebrates. We present the first global analysis for 574 species of freshwater crayfish using IUCN's trait-based approach. We collected species-specific information on sensitivity (9 traits), adaptability (4 traits), and exposure (5 traits) to climate change and combined those to assess the overall vulnerability. Based on an ensemble of four general circulation models for a moderate IPCC emission scenario (rcp6.0), our results predicted that 87 % of species are highly sensitive to climate change, primarily due to habitat specialization, 35 % have poor adaptive capacity and 57 % are highly exposed. Overall, 87 species (15%) assessed are predicted

to be highly vulnerable to climate change. Climate change-vulnerable species are distributed globally, with high concentrations found in south-eastern USA (36 species), Mexico (10 species) and the south-east of Australia (21 species). Species identified as climate vulnerable by our trait-based framework differ from those identified by experts in the IUCN Red List. Out of the 87 of our climate change-vulnerable species 50 are also included in the IUCN Red List as threatened species. Fewer species were found to be vulnerable under lower IPCC emission scenarios, indicating that reducing greenhouse emissions may reduce climate impacts on crayfish species. We found that climate change vulnerability was lower in crayfish than in terrestrial species. This study contributes to the application of CCVA to poorly-known, range restricted invertebrates using freshwater crayfish as a case study.

AVIFAUNA IN RE-CONNECTED ANDEAN FORESTS 10 YEARS AFTER THE RESTORATION OF CONNECTIVITY CORRIDORS

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Restoration of corridors to enhance connectivity and conservation of remnant forest strips or riparian habitats have been proposed as a valuable tool for maintaining or increasing diversity at regional scales. We synthetized results from three studies, focusing on the ecology of birds in a fragmented landscape dominated by a pasture matrix in a Sub-Andean region of central Colombia, and where four corridors where restored in 2003 -2006. Data were collected 10 years after restoration was implemented. We documented movement of a long-distant migrant and two understory resident species, using VHF radio telemetry. We were able to determine that the migratory species had no clear difficulties traversing a pasture matrix and returning to the capture site, while the understory residents avoided making lengthy flights and used stepping-stones and nearby corridors to ease their movement. Also, we chose six forest bird species with different responses to habitat fragmentation to study their home ranges and habitat use, at the landscape level. Using VHF radio telemetry, we followed 13 individuals and found that even though the landscape is dominated by a pasture matrix, species used mostly forest covers, both preserved and restored (40% and 30%, respectively) over any other type of habitat. This suggests that the restored corridors confer functional connectivity for forest-dependent bird species. During this time, we also studied molt and breeding of 20 individuals of 15 bird species within the restored corridors. 25% of the individuals showed a temporal molt-breeding overlap. Taken together, our findings suggest that restored corridors and riparian strips improve connectivity in this fragmented landscape and are highly important, not only for the movement of individuals but also as habitat, since key aspects of the life cycle were documented there.

AVOIDANCE BEHAVIOR MEETS TROPHIC CASCADES

Michael Patten, University of Oklahoma

Direct effects of human disturbance—from habitat destruction to over-hunting—to animal populations are well documented across habitats, biomes, and species. Indirect effects, by contrast, have received much less attention. An emerging field in applied ecology and conservation involves what could be called animal psychology, in which animal behavior is assessed with respect to pattern and process of cognition. A specific focus in this field has been on behavioral avoidance of or attraction to humans and their trappings. There is clear evidence of avoidance behavior in a variety of species, especially vertebrates, but the consequences of such behavior remain an open question. I explore the potential consequences of avoidance of humans by four species of mammals in urban reserves of coastal southern California. Each of the species exhibits a strong pattern of avoidance of human activity. The process by which two species avoid human activity is a temporal shift to become "more nocturnal," in that the species' activity peaks around dawn on days without humans' activity but nearer to midnight on days with human activity. On the basis of how activity is distributed around the clock, these shifts have brought the two species into substantially greater overlap with a key predator, in one case, and a key prey, in the other. This overlap likely will increase encounter rate between predator and prey, increasing relative risk of predation substantially, with a real potential consequence of marked trophic cascades. I explore various means by which such cascades, triggered initially by avoidance behavior, could affect the ecosystem. Conservation management of the system will require an appreciation of how human activity, even if putatively benign (e.g., hiking), could alter trophic dynamics, which will underscore the need for dynamic plans that can accommodate multiple "moving parts."

BAD AND GOOD NEWS IN BIODIVERSITY CONSERVATION SCIENCE IN THE LAST 15 YEARS

Laurent Godet, Centre National de la Recherche Scientifique; Vincent Devictor, Centre National de la Recherche Scientifique

Assessing the shape and fate of biodiversity is the central goal of conservation science. We conducted a systematic review of the 12,972 papers published from 2000 to 2015 in the 9 leading journals of conservation science to describe their distribution among the type of contribution to conservation science, the type of conclusion provided, the distribution of topic considered, and the major causes of bad news and good news for biodiversity. We found that the vast majority of papers (76%) are dedicated to methodological problems and ideas and do not lead to any direct conservation implications. Papers reporting bad news (n=1,194) are three times more numerous that those reporting good news (n=427). One third of the bad news is linked to habitat modification (n=351), followed by over-exploitation of resources (n=217) and negative impacts of invasive species (n=100). Two thirds of the good news (n=286) corresponded to the success of conservation measures (especially protected areas), whereas among the bad news, only 90 papers were attributed to the failures of conservation measures. Overall, both good and bad news are still much better documented in terrestrial than in marine ecosystems, and species other than birds, mammals and plants are by far less studied. However, this extensive literature review demonstrates that mainstream conservation biology is a dynamic and necessary discipline in the context of the biodiversity crisis. First because this discipline is improving a lot its methods and basic knowledge on biodiversity. Second because several conservation measures manage to slow down the crisis. Finally, the worldwide network of conservation biologists highlights that the general and simplistic message peddled by skeptical environmentalists on biodiversity is much more complex and has to be studied differently according to the different taxonomic groups, habitats and regions of the world.

BAIRDS TAPIR HABITAT USE IN A ROAD-FRAGMENTED FOREST COMPLEX IN THE HIGHLANDS OF COSTA RICA

Esteban Brenes-Mora, Nai Conservation

The road development contributes to deforestation, unregulated human colonization, poaching and direct mortality by road-kill, having greater impact when the road bisects forested areas. In Costa Rica, these roads have become a major threat for wildlife, specially in the last 20 years where traffic numbers have increased in 435%. The Panamerican Highway bisects several protected areas in Cordillera de Talamanca highlands, one of the largest continuous forest and most suitable habitats to maintain large mammal populations. This has become a threat to the endangered Baird's Tapir (*Tapirus bairdii*): in the last 6 years at least 22 individuals have been road-killed in a single 32km strip. Previous road-ecology studies in the region are based on carcasses, nevertheless, to have a better assessment of the situation it is necessary to understand how alive animals use the habitat around the road. Using detection/non-detection camera trap survey dataset, we elucidated factors affecting Baird's Tapir habitat use across a forest complex bisected by the Panamerican Highway. Habitat use was modelled using fine scale covariates and analytical techniques to account for spatial autocorrelation. We also investigated the relationship between road kills and road architecture. Tapir's habitat use was higher when closer to water bodies, inside protected areas and forest covered areas. Tapirs do not appear to change their habitat use near roads, meaning that their frequent use of forests along roads may make them more susceptible to collisions with cars. We found a correlation between high tapir habitat use areas and historical road-kills. Additionally, we found that most road-kills happened in straight segments of the road where forest is less than 5m away from the asphalt. Our findings are valuable for road development planning, specially to optimize the site selection of mitigation structures and predicting how this species will use the habitat when is fragmented by roads.

BAT DIVERSITY, WATER QUALITY, AND PASTORALISTS IN THE NORTHERN NAMIB DESERT

Theresa Laverty, Colorado State University; Joel Berger, Colorado State University

Desert life is often concentrated around rare bodies of open water. While traditionally these habitats were restricted to natural springs, artificial pools now play important roles in structuring wildlife, livestock, and human distributions in arid landscapes. Water bodies differ not only in physical dimensions, but also in chemistry, of which the latter can have profound influences on wildlife and livestock population health. Our research tests whether the activity and species richness of insectivorous bats can be used as indicators of water quality in the northern Namib Desert, Namibia. We measured 24 variables of water chemistry and quality at each site at the conclusion of the dry and wet seasons. Through the use of mist netting and acoustic monitoring, we determined bat activity and species richness above both natural and artificial bodies of water. While bat activity of certain species appears to differ between natural and artificial sites, water chemistry does not appear to differ between them. This indicates that physical features like water surface area and volume may be more important than water quality for certain species. For instance, capture rates of free-tailed bats like Sauromys petrophilus

are higher at larger water bodies and at artificial pools unobstructed by vegetation. If bats, or rather certain species of bats, can serve as indicator species, they could provide a cost- and time-efficient way to monitor wetland health in northwestern Namibia. In the face of even greater rainfall variation associated with climate change and overall water table declines, understanding the role that desert water plays in structuring large and small mammal communities alike is essential to their conservation.

BATTLEFIELDS AND BORDERS: THE PAST AND FUTURE OF COLLATERAL VALUES

Peter Smallwood, University of Richmond

The most familiar form of collateral value is the battlefield park, exemplified by Gettysburg National Military Park in Pennsylvania, USA. The park and associated neighboring sites comprise nearly 2500 hectares of land. While some of that land is devoted to buildings and parking lots, most of it is preserved as forests and meadows, providing ecosystem services to the region and to more than 1 million people who visit there annually. Less familiar are the ecosystem services created on certain borders between peoples in conflict. The DeMilitarized Zone (DMZ) between North and South Korea was created only to prevent renewed warfare between hostile nations, but has become a vital biodiversity hotspot. Other borders between nations and even alliances (e.g., the Iron Curtain between NATO and Warsaw Pact nations) have also developed collateral values. In some cases, the potential collateral value is used to help organize resolutions to border disputes. It seems likely that warfare will continue as a part of human existence for the foreseeable future. However, the nature of warfare has changed in ways that make the creation of future battlefields suitable for memorial parks unlikely. The battle at Gettysburg had clear geographic borders, mostly outside of the town. It was a large area where over 160,000 soldiers fought. Modern warfare rarely has clearly defined fronts. Specific battles are usually smaller in scale, and the largest of them usually happen in urban environments, not in natural landscapes. Thus, the future of collateral values from battlefields will depend upon our stewardship these landscapes. On the other hand, border conflicts remain common, especially in the eastern hemisphere. They may provide opportunities for cooperative agreements to manage those landscapes (and in some cases, seascapes) for ecosystem services as a means to manage the conflict.

BEE AND BIRD DIVERSITY FLOWER VISITORS IN A SEMIARID LOW-INPUT PERENNIAL AGROECOSYSTEM IN MEXICO

Mónica Riojas-López, Universidad de Guadalajara-CUCBA; Isis Díaz-Herrera, Universidad de Guadalajara-CUCBA; Hugo Fierros-López, Universidad de Guadalajara-CUCBA; Eric Mellink, Centro de Investigación Científica y Educación Superior de Ensenada

Eighty percent of the world´s crops depend to some degree on pollinators to maintain or increase their productivity. Bees and some bird species provide such pollination services. Paradoxically, agricultural expansion, in the form of highly-technified agro-ecosystems, is causing a severe pollinator crisis that threatens not only pollinators, but also the production of food and the conservation of wild relatives of domesticated species. Opposed to the trend to high-input high-production agrosystems, studies during the last 30 years has revealed that some low-input agro-ecosystems can be helpful allies in the conservation of biodiversity, as they are habitat for many species of wild plants and animals in lieu of disappeared natural habitats. In highly anthropized landscapes in Mexico´s central plateau, orchards of fruit-oriented nopal (Opuntia spp.) offer protection and food for pollinators due to the large quantity of nopal flowers, which are produced when other floral resources are scarce (March-May). Reported pollinators of nopal flowers were bees of the genera Lithurge and Diadasia, but little was known about particular species and about other nopal flower visitors. From 2013 to 2016 we studied visitors of nopal flowers, and recorded 8 species of birds and 30 of native bees that did so. All eight bird species were hummingbirds. Of the bees, the genus Lasioglossum was the genus with more species (seven). Five bee species were oligoleges: *Diadasia rinconis*, *Macrotera bicolor* and *M. azteca* are specialists of cacti flowers in general, while *Lithugus litoralis* y *Asmeadiella cactorium* are Opuntia flower specialists. Pollinators persist for as long as there were flowers in the orchards. Thus, nopal orchards in providing suitable habitat for the conservation of bird and bee pollinators at times when other resources are scarce help to support a pollinator community that can benefit other crops or wild plants and contribute to regional agricultural and ecological stability.

BEYOND TOTAL AREA NEW METRICS FOR MEASURING PROGRESS IN BUILDING ROBUST PROTECTED AREA NETWORKS

Carly Cook, Monash University

There has been rapid growth in protected areas over the past 20 years in response to targets set by the Convention

on Biological Diversity. The total area protected is the only global indicator of biodiversity conservation that is currently trending up. As a measure of conservation progress, the use of total area protected is widely criticised because it provides no information about the individual areas gained or lost, or whether they are likely to support the persistence of biodiversity. Understanding progress in building a robust protected area network requires a more detailed set of indicators that can reveal the dynamics of protected areas. Using a pressure, state, response framework, we propose a series of eight indicators that assess change in the structure of the protected area network (state), the stressors on individual protected areas (pressure) and in the level of protection and management investment (response). We illustrate the application of these indicators using the Australian protected area network, which has doubled in size over the past 20 years. However, the application of our metrics provides a very different picture, revealing that the areas added were mostly small and under increasing pressure from human populations and incompatible land uses (e.g., agriculture). We also reveal the extent of Protected Area Downgrading, Downsizing and Degazettement that occurred across the network between 1997-2014. Growth in area has mainly occurred in the lower protection categories (IUCN Category V and VI), and funding for management has failed to keep pace with the growth in area protected. Our results highlight significant flaws in total area protected as a measure of conservation progress, and reveal the value of a more detailed set of metrics to assess whether changes truly contribute to building a more robust protected area network.

BIAS AND PERSPECTIVES OF INSECT CONSERVATION: A EUROPEAN SCALE ANALYSIS

Camila Leandro, UPVM3 - CEFE

Insects are among the most diverse and abundant taxa; they are also responsible of many ecosystems functioning. However, Insect's decline, which is driven by anthropogenic perturbations, is little noticed. Some conservation actions have been set up to protect them, mostly around species lists. This is the case in Europe with the selection of 123 of the 105 000 European insect species. How scientist selected those "few" species? What makes an insect interesting to protect? Is there a bias in the selection process? The aim of this study was to compare the 123 protected species to 123 species randomly selected in the unprotected 105 000 species at the European scale. We considered a set of 16 characteristics divided into four categories: 'Taxonomy', 'Morphology', 'Ecology' and 'Knowledge'. We highlighted strong bias in species selection. For instance, the lists protect only a certain number of orders. Only the half of the species on the list have an IUCN status and less than the third are considered endangered. Protected species are significantly longer and most of them have patterns of colors. They also have a greater number of dedicated studies and benefit from "folk knowledge". Consequently, we argue for more objective criteria for species selection and an update of the lists. In parallel to this, we encourage the implementation of new technologies to boost systematic monitoring and have a clearer view of conservation targets. Overall, we propose a general framework for environmental policy as a perspective to improve the protection of insects at the European scale. Keywords: Environmental policy; Insect perception; Natura 2000 ; Berne Convention

BIOACOUSTIC MONITORING OF NEOTROPICAL OIL PALM LANDSCAPES

Paul Furumo, University of Puerto Rico-Rio Piedras; T. Mitchell Aide, University of Puerto Rico-Rio Piedras

Globalization has increased the demand for land-based commodities, driving the expansion of oil palm agriculture which has replaced tropical rainforests and caused notable species decline in Southeast Asia. In Latin America, most oil palm is expanding onto previously cleared lands, particularly cattle pastures. The implications of these land use changes for biodiversity are still not well understood; outside of rainforest conversion to oil palm plantations in Asia, little attention has been given to the conversion of other habitats or land uses. This study takes a novel approach to understanding how biodiversity responds to oil palm development under different land use change scenarios, by using bioacoustics to study oil palm landscapes in Colombia. We sampled acoustic diversity in three departments of the Caribbean coastal region of Colombia—Magdalena, Cesar, and La Guajira. We sampled ten oil palm landscapes during the rainy season from October – December 2016, including 55 sites on oil palm plantations, 20 sites on banana plantations, 6 sites in rice fields, 22 sites in cattle pastures, and 39 sites in forest fragments. We compare biodiversity of these different land use covers using soundscape analysis that maps the partitioning of acoustic space into time and frequency intervals. We also compare species richness and composition across land classes. Our preliminary results show that soundscape analysis is useful for grouping and comparing different habitats. Oil palm soundscapes are more similar to those of forest fragments than other land uses; species richness of oil palm is higher than other land uses and contains more forest species. If oil palm expansion continues to avoid forest loss and oil palm habitat provides a more hospitable matrix for species movement in the landscape than pastures, we conclude

that there may be an opportunity for more sustainable rural development in Latin America and easier adoption of certification programs like the RSPO.

BIOCULTURAL APPROACHES CAN ENSURE JUST AND EFFECTIVE CONSERVATION PROCESSES ACROSS DIVERSE CONTEXTS

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The current status and projected trajectories for all levels of biodiversity, from genetic to ecosystems, paint a dire picture. Isolated success stories provide key lessons, but on a global-scale conservation has been largely ineffective. Despite widespread approval and significant funding, the Convention on Biological Diversity has consistently failed to meet its targets. This dismal assessment has led to a search for alternatives. Two recent proposals have received substantial discussion: "New Conservation Science" focuses on human-dominated ecosystems and payments for ecosystem services, and "Half Earth" proposals aim to protect half the planet. The debate between these two views of conservation is far from just an academic squabble. The arguments pit against each other opposing value-orientations, different opinions on focal locations, and alternative designs for policy tools at the heart of conservation. Importantly, this intractable debate is not new, but rather cyclical, with roots at least a century deep in conservation history. We argue that these long-standing debates hinder progress in four important ways: (i) wasting valuable time and resources, (ii) ignoring a common goal of conserving biodiversity, (iii) failing to recognize the need for diverse solutions to match diverse contexts, and (iv) overlooking a central question - who should be involved in conservation actions? We contend that biocultural approaches, which are pluralistic, partnership-based and dynamic, can guide conservation processes past the traps of divisive debates. We synthesize lessons learned across multiple disciplines, including the commons, community-based conservation, traditional ecological knowledge, and social-ecological systems, to outline eight principles of biocultural approaches to conservation. We conclude with an analysis of case studies that demonstrate the value of applying biocultural approaches to conservation to create more just and effective outcomes.

BIODIVERSITY AND BEYOND: QUANTIFYING THE GLOBAL CO-BENEFITS OF SOURCE WATER PROTECTION

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Cities around the world are increasingly investing in source water protection to improve water quality and reduce water treatment costs. Source water protection activities add up to good land stewardship, which can generate co-benefits in the areas of biodiversity conservation, climate change mitigation and adaptation, and for human health and well-being. Analyzing the existing and potential source watersheds of 4,000 cities around the world, we find that activities such as habitat protection, restoration, and agricultural best management practices can make meaningful contributions toward global sustainability goals. For example, looking at the global ceiling of potential, we find that source water protection activities could reduce the ecoregional extinction risk for as many 5,400 terrestrial species; enable up to 44 countries to meet protected area targets through protecting natural habitat outside designated protected areas; contribute up to 16% of the climate change mitigation potential needed in the year 2050 to keep the world on a trajectory to limit warming below 2 degrees Celsius; reduce the risk, via lost pollination services, of increased micronutrient deficiency for over 2 billion people; and reduce nutrient inputs to over a quarter of known coastal eutrophication zones worldwide. While one in six cities may be able to pay for source water protection activities using water treatment savings alone, additional cities may find that source water protection becomes affordable by 'stacking' co-benefits. We will discuss these findings and the ways in which actors whose concerns span different co-benefits can come together to enable good land stewardship across the world's watersheds.

BIODIVERSITY THRESHOLDS FOR BIRD SPECIES AT THE SOUTH AMERICA SAVANNA

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Species extinction thresholds have been widely investigated and are now a useful tool for environmental management and conservation actions. Those thresholds represent minimum habitat amount for species survival, below which species disappear rapidly. When thresholds of several species concur, biodiversity loss change occur suddenly. Those thresholds have been investigated in forested landscapes, but little is known about their existence in more heterogeneous savanna landscapes, where open and forested physiognomies co-exist naturally. This is one of the first studies to test biodiversity threshold in a savanna vegetation, the Brazilian "Cerrado", one of the biodiversity hotspots of the Earth. We assessed bird species richness in 74 locations distributed across a wide range of native vegetation cover, spread throughout a large region of 22,267,428.97 ha, in central Brazil. Here we considered only forested patches surrounded by savanna vegetation. We performed 2,425 net hours, and tested the relationship of forest-dependent bird species richness with different landscape structural parameters. Forest cover was the most important variable influencing changes on species richness and a bird extinction threshold was detected around 14% (10-19%) of remaining forest cover. This threshold is low when compared with values obtained in forested biomes (Atlantic Forest, Amazonian Forest), where values range between 30 and 40% of forest left. We hypothesized that this difference can be related with the higher quality of the Cerrado's matrix, which contains other non-forest vegetation cover that can facilitate bird biological fluxes. Our results can help to support landscape planning and management decisions in savannas landscapes, suggesting new minimal parameters for forest cover in savannas landscapes, and also helping to identify key priority areas for restoration and conservation.

BIOLOGY AND MANAGEMENT OF SCARUS TRISPINOSUS THE ENDANGERED SOUTHWESTERN ATLANTICS REEF FISH

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The Brazilian-endemic greenback parrotfish, *Scarus trispinosus* is the largest herbivorous reef fish in the South Atlantic, where it plays key ecosystem functions. Following the sharp decline of large carnivorous reef fishes, parrotfishes (*Labridae: Scarinae*) were progressively targeted by commercial fisheries. As a result of this "fishing down the food web" process, the population of *S. trispinosus* was reduced by ~50% over the past three decades, and it is now EN. Most of the remnant population is concentrated in the Abrolhos Bank, where the present study was conducted. We present novel information on age, growth and the reproductive cycle of *S. trispinosus*, based on 814 individuals obtained from commercial fisheries' landings and scientific collections, between 2010 and 2013. Histological analyzes confirmed that it is a protogynous hermaphrodite. Sex ratio was biased towards females (1:8), and spawning occurred year-round with discrete peaks in February-March and June-December. Increment analysis indicated annual deposition of growth rings in otoliths, which presented 1-22 rings. The asymptotic length at which growth is zero ($L\infty$) was estimated from Bayesian logistic regression at 85.28 cm, growth rate (K) at 0.14*year-1, and the theoretical age at zero size (t0) at 0.16. Slower-growing individuals occurred in shallower inshore reefs, where fishing pressure is higher. Conversely, faster-growing and older individuals predominate in deeper offshore sites. Samples obtained by spearfishing and gillnet fisheries performed in inshore and offshore reefs included 10.6% of juveniles and 89.4% of adults (n=2,458). The National fishing ban was started in 2014, following IUCN assessment. Here, we demonstrate that *S. trispinosus* is highly vulnerable to over-exploitation due to its longevity, slow-growth, and complex sexual patterns, and recommend that the precautionary fishing ban is resumed and populations are monitored with non-lethal methods until recovery is demonstrated.

BIOTIC HOMOGENIZATION IN PLANT COMMUNITIES REVEALED BY CITIZEN SCIENCE MONITORING

Gabrielle Martin, National Museum of Natural History; Nathalie Machon, National Museum of Natural History; Nathalie Machon, National Museum of Natural History

Ecosystem alteration caused by human activities and biological invasions influence species distribution and ecosystems functioning. Biotic homogenization, a temporal increase in community taxonomic, functional or phylogenetic similarity, is one of the consequences of global change on biodiversity. To document this phenomenon in plant communities, surveys of common species are needed at large spatial and temporal scales. Nationwide monitoring of common plant species, notably in Great Britain and Switzerland, have evidenced such increase in plant community similarity, associated with local replacement of specialist by generalist species, most likely caused by eutrophication and temperature increases. Citizen science, the collaboration of networks

of volunteers and research teams on a common research question, is a potentially powerful alternative tool to monitor common flora at large scale. Vigie-flore is a French citizen science observatory designed to monitor wild plants in France and detect changes in plant community composition related to human activities, habitat fragmentation or global change. In this study, we used 8 years of data (2009-2016) from the citizen science programme Vigie-flore to measure biotic homogenization in plant communities at a national scale. Biotic homogenization was assessed by quantifying changes in Ψand Ψdiversity, using both taxonomic and functional diversity and by partitioning Ψdiversity into species replacement and richness differences. A total of 2965 plots located in different habitats throughout France were monitored by 294 observers. The results show that biotic homogenization occurs, but is not constant throughout France: it occurs more rapidly at higher latitudes. Besides, the proportion of species tolerant to high temperature has been increasing steadily since 2009. These results are used to map spatial and temporal variations of plant community composition in France, and to discuss the possible drivers.

BIRD EXTINCTIONS AND DRIVERS OF CHANGE: SAN ANTONIO 100 YEARS LATER AND BEYOND

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Disentangling the impacts of major drivers of change such as forest fragmentation and climate change is crucial for developing effective conservation actions. Here we present a longitudinal study that evaluated changes over 100 years in the bird community of the cloud forest of San Antonio, a truncated mountain summit with maximal elevations of 2200 m in the western Andes of Colombia, with surveys dating back to 1911. We evaluated the impact of past forest fragmentation and hypothesised about the future impact of climate change, assuming ongoing conservation programs are maintained and forest cover does not decrease. We divided our analysis in two periods: 1911-1991, when forest fragmentation occurred and 1991-2016, defined by conservation interventions and forest cover recovery. The original forest avifauna in 1911 consisted of 130 species. During 1911-1991, 35 species were extirpated (25%) and 26 showed decreasing population trends. For 1991-2016 no further extirpations occurred, 14 species reestablished populations and only 4 showed declining trends. After 100 years, 21 species remain absent and 28 show declines. Several extirpated species are present in the nearby Farallones de Cali Natural Park with elevational continuity and less fragmentation. Our climate change analysis shows 51 species (47% of the bird community) with medium (21) or high vulnerability (30) using criteria related to habitat specialisation, elevational distribution, abundance and body size. Additionally, we project 13 mountaintop extinctions in a worst-case climate change scenario (RCP 8.5, IPCC AR5). The effects of fragmentation are reversible, were we to establish forest corridors. Thus, climate change is potentially a larger threat. Our work provides a case-study that separates the effects of two major drivers of change over a long-time period and provides a baseline for future evaluations of the impact of climate change on an Andean bird community.

BODY SIZE TEMPORAL CHANGE: THE EFFECT OF CLIMATE ANOMALIES ON TEMPERATE SONGBIRDS

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Body size decline has been proposed as a universal response to climate warming, but empirical evidence is controversial. We test whether body size is negatively related to temperature, or rather explained by variations in food availability in French songbirds. We also explore whether annual, population-level variations of mean body size are due to changes of juvenile size and/or size-dependent mortality over the first year. We tested for relationships between wing length (n = 107,193) or body mass (n = 82,022) and local anomalies in temperature, precipitation and primary production during the breeding period for 41 species, from 257 sites, for juveniles and adults separately. For four species and 46 sites, we assessed whether changes in mean population body size over the first year of life suggested climate-driven size-dependent mortality. Juveniles were larger in years with locally high primary production. Adults did not respond to any variable. We found no evidence of climate-driven size-dependent mortality. Our results support that body size is mainly driven by food availability during the period of growth in temperate songbirds. We suggest that former studies evidencing a hot-induced size reduction were biased towards organisms from hot climates, operating close from their upper thermal limit. In the temperate climate of France, recent temperature increases would not have been sufficiently extreme to select against large individuals. Temperate songbirds would indeed be more constrained by cold than by over-heating. Hence body size decline is not a universal response to climate warming.

BRINGING MODERN SCIENCE TO IMPROVE COEXISTENCE BETWEEN PUMAS AND PEOPLE IN CHILE

Omar Ohrens, University of Wisconsin-Madison; Adrian Treves, University of Wisconsin-Madison

Mitigation of human-carnivore conflicts can support both carnivore conservation and the protection of people's property. Retaliatory or preventive killing of carnivores appears as the major threat to puma populations in Chile. Nevertheless, the responsible government agencies have not succeeded in diminishing public concerns about human-puma conflict scientifically, cost-effectively and acceptably for Chilean society, mainly due to lack of resources. Some farmers wishing to use non-lethal methods to prevent predation on livestock have expressed dissatisfaction with efforts by government agencies to verify predation events or support the farmers' prevention efforts. Participation appears essential to successful implementation of effective interventions, and to reduce tensions between institutions and people. Here, we present a novel participatory approach, were we engaged local stakeholders in two ecoregions in Chile to design, and implement both a verification system and non-lethal interventions. We highlight the use of gold standard design, such as randomized control trials, to evaluate the effectiveness of non-lethal interventions that would place puma conservation and livestock protection on a firmer scientific footing and advance coexistence strategies across the country. We anticipate that our conservation outcome will improve puma survival and recolonization of suitable habitats in coexistence with people in Chile. In addition, having partners in the national ministries that oversee carnivore management, livestock management, and protected areas should increase our chance of influencing national policy and management methods. So far, results show that agreed interventions are having positive effects in reducing puma attacks on livestock, and that trained verifiers have been crucial in improving procedures and timely verification of complaints of livestock loss.

CAMPESINO HUNTING KNOWLEDGE: CULTURAL SIGNIFICANCE AND CONSERVATION IMPLICATIONS

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Uses and perceptions of biodiversity are influenced by culture. Yet "culture" is often equated with "indigenous" in discourse about conservation in rural regions of Latin America. Despite great attention on local and traditional communities as targets and participants in conservation efforts, conservationists tend to understand relatively little about the cultures or the local and traditional ecological knowledge (LTK) of campesino communities. In fact, scholars and conservationists tend to characterize campesinos as cultureless or uneducated peasants with only opportunistic or indiscriminate hunting habits. The lack of understanding of campesino hunting leads to conflicts as conservationists miss the cultural significance of campesino LTK linked to biodiversity use. In this study, we used cultural consensus theory and ethnographic methods (interviews, focus groups, participant observation of hunting trips) to evaluate campesino hunting culture and LTK in Cárdenas, Nicaragua. Cultural consensus data from 50 campesinos (30 men and 20 women) showed that hunting knowledge is shared among most campesinos, supporting the presence of a hunting culture in the region. This knowledge not only comprised hunting strategies and animals, but was also rooted in the social (e.g., hunting beliefs), political (e.g., restrictions), and historical (e.g., as part of Nicaraguan past) aspects of hunting. When matched with narratives and observations, these data revealed how shared histories in poverty and limited resources are foundations of the campesino hunting culture and are built on LTK. That is, our results indicate that the aspects of campesino livelihoods that often inform outsiders' perceptions of campesinos are components of their cultural identity. We suggest conservationists can improve conservation outcomes by understanding campesino hunting as not only a conservation concern, but also an extension of a shared knowledge and identity tied to poverty and resource scarcity.

CAN CONSERVATION BUFFER THE IMPACT OF INVASIVE SPECIES? INSIGHTS FROM NEOTROPICAL RIVER OTTER SCATS

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As a result of human activities, some species have expanded their distribution into areas that were historically difficult or impossible to reach by natural dispersal. Such species may become invasive if they successfully establish reproductive populations and may represent a threat to native species. Predation on invasive species by native species can affect trophic interactions with other preys, resulting in a cascading restructuring of the trophic web. Here we examine effects of an invasive fish (Armored Catfish: *Pterygoplichtys sp.*) on the diet composition of a native piscivorous predator (Neotropical river otter: *Lontra longicaudis*) in northern Guatemala. We compare results from two sites: one inside a protected area (San Pedro River, in Laguna del Tigre National Park), and another

outside of the protected area (La Passion River). To evaluate the effect that *Pterygoplichtys sp*. has on the diet of *L. longicaudis*, we collected otter scat samples five and ten years after the first report of the catfish in each area. In all cases, *Pterygoplichtys sp*. was the main prey item for *L. longicaudis*. Occurrence of catfish in scat samples was highest (50%) in samples collected from La Pasion River 10 years after the first report of the catfish. Niche breadth of the otter in La Pasion River was lower 10 years after the invasion in comparison to 5 years after the time of invasion (Levins' standardized index: 0.31 in 2010 to 0.06 in 2015). There was no comparable change in niche breadth in San Pedro River (0.21 in 2009 to 0.20 in 2015). These results suggest that the level of conservation in an area can buffer the effects of invasive species on the diet of native predators. A higher intensity in the fisheries directed to native fish and greater degradation in the riparian forest in La Pasion River, could be the drivers that can facilitate the impacts of the catfish, but further research is needed to evaluate this drivers.

CAN THE CURRENT BIODIVERSITY OFFSET POLICY ACHIEVE A BIODIVERSITY: NO-NET-LOSS IN COLOMBIA

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In order to balance economic growth and biodiversity conservation, many governments allow private companies to transform or destroy native ecosystems as long as these are conserved, restored or re-created elsewhere with the aim of achieving "no-net-loss". In Colombia, current legislation recognizes eleven types of activities that require offsetting. In particular, loss of biodiversity through infrastructure development mandates the conservation of extant native ecosystems or their restoration. We evaluated the potential of this specific policy in achieving no-net-loss by revising current biodiversity offset plans submitted to the government by the energy, hydrocarbon and highway sectors. We focused specifically on ecosystem restoration plans because of their inherent complexity in reaching long-term goals for which sound design, implementation and monitoring are essential. An analysis of all of 20 restoration plans, submitted so far, showed a low potential for achieving no-net-loss. Several factors contribute to this shortcoming and need urgent policy adjustments: A) the loophole contained in Colombia´s National Restoration Plan that recognizes rehabilitation, reclamation, and agroforestry as a restorative activity up-to-par with ecological restoration. While these practices will certainly overcome degradation, they are unlikely to compensate fully for biodiversity loss. B) The lack of clarity among private companies and their contractors on effective restoration practices, as vague goals and inappropriate methodologies were common in most of the plans examined. C) Restoration monitoring protocols were conceptually and methodologically weak thus hampering adaptive management. D) Current legislation does not require companies to manage and protect the restoration site during ecosystem development -both in ecological and social terms. Finally, current practice of basing conservation and restoration only on monetary incentives to local communities is unsustainable.

CAN WE USE SOCIAL MEDIA DATA TO UNDERSTAND TOURISTS' PREFERENCES FOR BIODIVERSITY IN PROTECTED AREAS?

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Understanding tourists 'preferences for biodiversity and nature-based experiences is crucial to inform conservation management and marketing in protected areas. However, surveyed-based methodologies, which are traditionally used to assess such preferences, are costly, in terms of time and resources, and limited in space and time. We explored the reliability of using social media, as opposed to traditional surveys, as a novel and cost-effective way to understand tourists' preferences for biodiversity and nature-based experiences in protected areas. To do this, we compared preferences for biodiversity obtained from a traditional survey conducted in Kruger National Park, South Africa, with observed preferences assessed from over 13,600 pictures shared on Instagram and Flickr by tourists visiting the park in the same period. We found no statistical difference between surveyed and observed preferences, suggesting that content shared on social media can potentially be used to explore preferences for biodiversity and human activities in protected areas. In addition, we found that Flickr can be used to explore existing and new markets for neglected less charismatic biodiversity, while Instagram can be used to explore conservation opportunities based on human activities and preferences for cultural services (e.g., recreation) inside protected areas. Findings of this research reveal the potential of using social media as an innovative and freely available source to inform conservation decision-making. Protected areas managers and Non-Governmental Organizations worldwide may take advantage of the data generated on social media to explore tourism markets in areas where survey-based methodologies are difficult to implement, or when resources are scarce. As the use of

social media is growing worldwide, its potential to inform conservation science and practice is also likely to grow in the future.

CAPACITY BUILDING AND CONSERVATION OF MAURITIA SWAMPS: A LANDSCAPE LEVEL PARTICIPATORY APPROACH

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The Llanos, extensive natural savannas east of the Andes, are the second largest biogeographic area in Colombia, receiving enormous attention due to high impact development involving huge agro industrial projects that threaten biodiversity. Mauritia palm swamps in the Llanos supply multiple ecosystem services, and have been prioritized by local, regional and national institutions. Nonetheless, they have been affected by cattle ranching, altering the fire regimes and affecting rates of natural ecosystem regeneration. Under "The Wildlife Project", Yoluka NGO led conservation programs together with several institutions, focusing on ten species of wildlife in the Llanos and the Valley of the Magdalena river, the major river drainage in the Colombian economy. The program focused on conservation of Mauritia palm swamp, designing and implementing conservation plans, by adaptive management and capacity building with land owners of more than 3400 hectares. Six major lines of work were addressed and established successfully: Mauritia palm and other native forest species nurseries, rehabilitation of Mauritia palm swamps, fire management, silvopastoral systems, sustainable harvesting, and monitoring/communication programs. The results of the program were three nurseries built with five major conservation agreements, more than 8800 Mauritia seedlings, 2200 native tree seedlings, 14.2 hectares dedicated to restoration processes, 28.2 hectares of silvopastoral sustainable producing systems, an international fire management workshop, six fire contingency plans, one workshop of sustainable harvesting, and 21 plots dedicated exclusively to biological monitoring.

CAPACITY GAPS HINDER THE PERFORMANCE OF MARINE PROTECTED AREAS GLOBALLY

David Gill, Conservation International/George Mason University

Amidst a proliferation of marine protected areas (MPAs) to conserve marine resources, it is unclear whether many MPAs are being effectively and equitably managed, and how MPA management influences substantive outcomes. We developed a global database of management and fish population data (433 and 218 MPAs, respectively) to assess: 1) MPA management processes; 2) MPA impacts on fish populations, and; 3) relationships between management processes and ecological impacts. Many MPAs failed to meet thresholds for effective and equitable management processes, with widespread shortfalls in staff and financial resources. Although 71% of MPAs positively impacted fish populations, these conservation impacts were highly variable. Staff and budget capacity were the strongest predictors of conservation impacts: MPAs with adequate staff capacity had ecological impacts 2.9 times greater than MPAs with inadequate capacity. Thus, continued global expansion of MPAs without adequate investment in human and financial capacity will likely lead to sub-optimal conservation outcomes.

CARNIVORE DISTRIBUTIONS AND HUMAN-CARNIVORE CONFLICTS: WILD CANIDS IN INDIA AS A CASE STUDY

Arjun Srivathsa, University of Florida

Protected areas constitute a mere 4% of India's land area. Throughout India's conservation history, protection efforts have mostly been restricted to large mammals within parks. Many species of carnivores inhabit unprotected human-dominated landscapes. Several species of wild canids in India typify this issue, but are among the least-studied carnivores, globally. We conducted sign surveys and questionnaire surveys in 2015-2016 across c.7000 km2 of the Kanha-Pench forest corridor in central India. Using an array of 128 52-km2 grid-cells, we assessed patterns of distribution of wild canids, and examined human-canid interactions in the region. We focused on the dhole *Cuon alpinus*, Indian fox *Vulpes bengalensis*, Indian jackal *Canis aureus* and Indian wolf *Canis lupus*. We also included the striped hyena *Hyaena hyaena*, because of similarities in their ecological requirements. Results from sign surveys and occupancy models indicated that wild canids occupied large parts of the landscape, ranging from 4% for dholes to 82% for jackals. Combining interview surveys of 675 local people and multi-state occupancy models, we estimated probability of conflict ranging from 33% for dholes to 87% for wolves. In general, scrub forests and terrain heterogeneity were important for canid occurrence. Presence of free-ranging/feral dogs and agricultural lands also influenced occupancy patterns of these carnivores. We further explored the effects of land-use, anthropogenic factors, and livestock-holding by households on patterns of conflict. Results from our study provide insights on the ecology of these five data-deficient carnivores in human-dominated landscapes. We propose

that prioritization and zoning of areas could facilitate persistence of carnivores in this human-dominated landscape. Based on our results, we provide (1) species-specific management recommendations and (2) innovative methods of communicating such results with local people, wildlife managers, and popular media.

CARPE DIEM: A TOOL TO AUTOMATICALLY DETECT AND IDENTIFY ANIMAL SPECIES FROM CAMERA TRAPS

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Technological advances in digital photography have opened up opportunities for cost-effective, non-invasive detection of wildlife via camera trapping. Camera trap surveys are used in ecological investigations, inventory and monitoring networks and in cataloging biodiversity. With cameras getting cheaper and battery life and storage capacities continuously improving, the numbers of cameras deployed per study and the images taken increase considerably. Practitioners then face thousands to millions of images that have to be identified and catalogued manually. Additionally, cameras are often triggered by moving vegetation producing large numbers of images that do not show an animal. We have developed a tool that automatically identifies animals in camera trap images. The tool uses an active learning algorithm that is trained with a small subset of manually classified images to distinguish objects (in our case animals) from background noise and to identify animal species expected in a study area. The algorithm is then able to detect and identify the expected animal species but also detects the presence of novel species. Images that don't show an animal are filtered out and users are only presented with images that contain animals. This reduces the work load for the human observer significantly. In a web-based interface, users can verify whether an animal was successfully detected and the species correctly identified. This information feeds back into the algorithm, continually improving detection and identification success and potentially leading to success rates that render manual identification unnecessary. Detection and classification errors can be statistically tested and incorporated in the data analysis. The use of automatic classification may prevent errors caused by manual data entry or inconsistent naming conventions. The implementation in a web-based application facilitates the use in large research projects with multiple study sites or citizen-science projects.

CHALLENGES OF BRIDGING KNOWLEDGE IN THE AMAZON: THE CASE OF ASTROCARYUM CHAMBIRA

Camilo Alejo, Potificia Universidad Javeriana

Bridging traditional and scientific knowledge systems is crucial in decision making for natural resource governance and conservation. That process maintains the integrity of each knowledge system and creates conditions for mutual learning. Even though, bridging knowledge is complex because scientific and traditional knowledge are configured by different social, political, and cultural contexts. Furthermore, both are heterogeneous and dynamic. In order to explore opportunities and challenges of bridging knowledge, we analyzed the traditional and scientific ecological knowledge of the palm *Astrocaryum chambira*, in Amacayacu National Park (Colombian Amazon). In this scenario, our objective was to explore the governance of chambira, emphasizing in local actors, practices, and institutions of the knowledge systems involved, through an interdisciplinary approach. On the first place, we analyzed a knowledge social network created through household surveys and participatory workshops with local leaders. The network exhibited local traditional subgroups based on age and gender. We also tracked key actors of the network such as local teachers, NGOs, scientists, and women leaders. After, some local key actors of the network participated in focus groups to assess management and traditional institutions. Results confirmed that local traditional knowledge of chambira differs on age and gender. Using the previous results and ecological literature, we established constraints and opportunities for bridging knowledge for *A. chambira* governance and conservation. Our approach showed that elders approximate to scientific knowledge recommendations on extraction frequency, but women propose a wider set of rules for management. Moreover, young resource users regardless gender is open to scientific management practices, while elders oppose to western influence. This case study reflects tensions but also unveils implications and possible strategies for bridging knowledge.

CHANGE OF COURSE IN CONSERVATION PLANNING: LEVERAGING ECOSYSTEM-BASED ACTION IN BRAZIL

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There is no doubt whatsoever that increasing effectiveness of conservation efforts includes targeting biodiversity in

all its levels of organization and considering ecological processes and interactions as essential factors for maintaining diversity. In that scenario, performing better conservation planning in a rapid changing world requires a common systemic vision between science and society that facilitates the applicability of knowledge to decision making and conservation planning. In addition, the intrinsic fluidity of ecological fluxes and processes make it ineffective to plan and implement conservation measures based on a territorial perspective. Therefore, it is a demand for all countries to develop decision-supporting tools for integrating a comprehensive ecosystem-based approach to policy making. To ensure the scientific accuracy and credibility, specialists tend to adopt standardized instruments that allow monitoring, comparison and integration of local data to international experiences. However, effectively integrating the ecosystem approach to decision-making and conservation planning is still a challenge and must be faced with a collaborative effort between scientists and policy makers. Developing solutions based on the reality and needs of national governments helps promoting large-scale and long-term adhesion. By analyzing the currently used decision-supporting tools in Brazil and understanding the main gaps, challenges and needs of the national environmental policies, it is possible to come up with a pragmatic and promising option: adopting the Red List of Ecosystems (RLE). Considering the complexity of the megadiverse country, the RLE will provide a sound framework for supporting the design of national conservation strategies. Moreover, by adopting this credible tool, Brazil would place itself as a pioneer and the lessons learned from a country-wide initiative would help consolidating an ecosystem-based agenda in Latin America.

CHANGES IN TIGER HABITAT CONNECTIVITY IN RIAU SUMATRA

Erin Poor, Virginia Tech; Marcella Kelly, Dept of Fisheries and Wildlife; Yang Shao, Virginia Tech

Riau Province, in central Sumatra, with its peatland, lowland and montane forest habitats, was once a stronghold for Sumatran tiger (*Panthera tigris sumatrae*) populations. Today, Riau may have one of the highest deforestation rates in the world and wildlife populations are dwindling, with natural forest now comprising approximately 18% of the province, mostly contained within protected areas. Agriculture (acacia, rubber, and oil palm) makes up the majority of Riau's land cover, and deforestation for the creation of new plantations is rampant. Natural forest and tigers still remain in Bukit Tigapuluh National Park and Rimbang Baling Wildlife Reserve, which remain connected to tiger populations in montane forest on the western edge of Sumatra. Historically, Tesso Nilo National Park was a stronghold for tiger populations with lowland rainforest connecting Sumatra's western montane forests to its eastern peatlands, but, due to illegal clearing, from 2000-2014 natural forest in Tesso Nilo was reduced by 60%. In this study, using remotely sensed imagery we model land cover and habitat connectivity change between Bukit Tigapuluh, Rimbang Baling and Tesso Nilo to determine how much natural forest remains, whether connections remain along the east-west gradient, and how drivers of deforestation have impacted these changes. Preliminary results show extreme isolation of Tesso Nilo, and narrow corridors connecting Bukit Tigapuluh and Rimbang Baling, possibly restricting province-wide tiger dispersal. These past changes allow us to predict how habitat connectivity is likely to progress into the future, given current development pressures, and we make recommendations to improve or ensure future habitat connectivity for tigers.

CHANGING AVIAN MIGRATION DISTANCES VIA CLIMATE-DRIVEN SHIFTS IN BREEDING AND WINTERING RANGES

Shannon Curley, CUNY Graduate Center, College of Staten Island; Lisa Manne, City University of New York; Richard Veit, CUNY, College of Staten Island

In response to anthropogenic climate change, northward shifts in avian breeding distributions have been reported in the northern hemisphere. Migratory birds present a challenge in predicting ecological responses to climate change as breeding and wintering habitats occur in distinctly different locations, therefore, the effects of climate change that elicit an ecological response in one portion of the distribution will not necessarily demonstrate an identical outcome in another. If range shifts act as an ecological response to climate drivers than we can expect incongruous magnitudes in range shifts when wintering and breeding ranges are treated independently. Thus, different rates of range shift could increase or decrease the migration distance between the seasons. This study employs two long-term surveys of avian abundances in North America, Breeding Bird Survey (BBS) and Christmas Bird Count (CBC). We hypothesized that migratory species are shifting their winter ranges at the same rate and magnitude as shifts in their breeding ranges, and tested this hypothesis with the short-distance migratory birds of North America, using data from 1990-2015. Over these 25 years, almost equal numbers of bird species significantly shifted their breeding ranges north vs. south vs. no shift. Conversely, while 30% of the bird species significantly shifted their wintering ranges northward, only 6% shifted wintering ranges southward, leaving 64% of wintering

ranges statistically unchanged. These differential shifts in wintering and breeding ranges have implications for changes in migration distances: 23%/42%/35% of species have statistically larger/unchanged/smaller migration distances respectively. We further investigated whether change in migration distance is related to habitat, phylogeny or natural history, and close with an analysis of future changes we might expect in average migration distances, based on trends in today's data.

CITIZEN SCIENCE SURVEYS OF URBAN BIODIVERSITY INFORM LAND-USE POLICY AND MANAGEMENT

Sarah Reed, Wildlife Conservation Society; Liba Pejchar, Colorado State University

Over half of the world's population now lives in cities, and preserving natural areas in urban ecosystems is critical for conserving biodiversity, maintaining ecosystem function, and sustaining human well-being. For three years (2014-2016), we surveyed bird and butterfly communities with volunteer citizen scientists in a rapidly growing mid-sized city. We conducted point-count and Pollard-walk surveys in 166 urban natural areas stratified among nine land uses ranging from formal city parks and nature reserves to schoolyards and community gardens. Of more than 60 site and landscape variables, land use had the strongest influence on species richness and community composition. Bird species richness and representation of urban-sensitive and grassland-specialist birds were greatest in public nature reserves and private open spaces certified for their natural resource values. Representation of native and migratory butterflies was also greatest in lands managed for natural resources, whereas butterfly species richness was greatest in city parks and community gardens. Vegetation cover, distance to water, and impervious surface cover were site characteristics that influenced the occupancy of the greatest numbers of individual species. In addition, citizen scientists improved their knowledge of bird and butterfly ecology, became more familiar with city natural areas, felt more connected to nature, and reported an increased interest in getting involved with conservation initiatives as a result of participating in the program. Our project is closely linked to an ongoing community planning process, which aims to maintain connections between people and nature and preserve high-quality natural areas as the city grows. We will conclude by highlighting specific ways the project's results are being applied to land-use policy, planning decisions, and management actions, and how it can serve as a relevant model for other communities facing similar challenges.

CLIMATE CHANGE ADAPTATION FOR MAMMALS CHALLENGED BY ASYMMETRIC TRANSBOUNDARY PROTECTION

Daniel Thornton, Washington State University; Lyn Branch, Dept Wildlife Ecology & Conservation, University of Florida; Rosmery Nerey Rodriguez, University of Florida

Extensive changes in climate occurring across the Americas require conservation action and planning that is large-scale, international, and proactive. Given observed and predicted range shifts toward the poles due to climate change, poleward populations of species may become increasingly important to conserve as fronts of range expansion and persistence. However, ensuring adequate protection of poleward populations is complex, particularly for transboundary species that cross international borders and experience varying national priorities for conservation. Yet, little is known about the nature of transboundary ranges and the degree to which protection of a single species varies along a north-south gradient. Using established range maps for all mammal species in the Americas, we identified transboundary mammals whose poleward vs. equatorial range limits fall in different countries and determined national-level protected status of each range segment. Over 50% of mammals had ranges where the poleward vs. equatorial range limit fell within different countries. We document slightly greater rates of protection for equatorial (17%) vs. poleward segments (14%). Moreover, ~20% of transboundary species experience asymmetric protection, with one range limit protected more strongly than the other, and with a slight bias toward greater protection for equatorial range limits. Our results highlight difficulties in large-scale planning for climate change, given that over 800 mammals are transboundary from pole to equator. Asymmetries in cross-border protection of a single species could threaten persistence of the unprotected populations, and is especially relevant in light of expected range shifts as the climate warms, which will push suitable habitat toward poleward limits that are currently unprotected for many sensitive transboundary species. We suggest that greater coordination of protection for western hemisphere mammals across international borders is warranted.

CLIMATE CHANGE EFFECTS ON A MAMMALIAN-RICH AND PHYLOGENETIC DIVERSE NEOTROPICAL HOTSPOT

Ricardo Bovendorp, Estate University of Sao Paulo; Mauro Galetti, Departamento Ecologia, Unesp; Alexandre Percequillo, University of São Paulo

Climate change is expected to impact several parts of any ecosystem, and mammalian assemblages are no

exception. Most mammalian species will not be able to cope with the effects of climate change, being either both positively and negatively affected by such changes. Small mammals, here Rodents and marsupials, plays important roles in many systems, they are the primary prey for many predators and they can also affect the composition of plant communities through seed predation and dispersion. As they comprise the most diverse group of mammals, changes are expected to occur in this group. Using 283 sites in a species-rich biome, the Brazilian Atlantic Forest, we determined the influence of precipitation, temperature and altitude on small mammal assemblages, employing metrics as species richness and phylogenetic diversity (PD). We also modeling projections for the year 2080 based on Global Climate Data to evaluate how these communities will respond facing climate change. Our results show that for all assemblages compared simultaneously, species richness and PD grow as precipitation and altitude increase, and the other hand, that species richness and PD decrease as temperature increase. The Southeastern region has the greatest species richness and PD followed by Northeastern and Southern regions. Also, the communities on Southeastern are more affected by low precipitation and high temperatures, mainly in low altitudes compared with the other regions. It is expected a 35% decrease in PD and 27% on richness for the small mammals on Atlantic forest in the next 63 years due the climate change. The Southeastern region will be the most affected by the climatic changes, while the southern region will be the least affected. We consider that dispersal capacity is essential in determining the response of different lineages to climate change. Our results suggest that protecting large-scale elevation gradients retains PD by allowing species to migrate in response to climate change

CLIMATE CHANGE IMPACTS ON BIRDS AND IMPORTANT BIRD AREAS IN LATIN AMERICA AND THE CARIBBEAN

Chad Wilsey, National Audubon Society; Stuart Butchart, BirdLife International; Lotem Taylor, National Audubon Society; Alke Voskaamp, Durham University; Stephen Willis, University of Durham

A network of more than 1,700 Important Bird and Biodiversity Areas (IBAs) exists in Latin America and the Caribbean. These sites have met globally established criteria for biodiversity importance based on the populations of bird species of conservation concern they support. We provide climate change adaptation management recommendations for each of these IBAs based on a regional analysis of climate change impacts for 3,801 bird species. Species distribution models were created characterizing the relationship between species distributions and recent climate, and used to project species' distributions in 2050 based on multiple greenhouse gas emissions scenarios. We then estimated species turnover rates for each IBA and grouped IBAs into one of five climate change adaptation categories. Classes are then translated into broad management recommendations reflecting the projected changes for each IBA. Across all 3,801 bird species analyzed, distribution extent across the region is projected to decrease, on average, to 44% of their current extent by mid-century. Among species with the greatest projected range loss, 14 are Critically Endangered and 58 Endangered per the IUCN. Median turnover of priority species, (i.e., those associated with the creation of each IBA), was 33% across all IBAs. Forty-four IBAs had turnover rates above 70%. Nearly every country included IBAs with high species persistence or increasing species diversity over time, making their effective conservation a high priority. Currently, 43% of those IBAs are unprotected and 41% are only partially covered by protected areas. Our results were incorporated into a Climate Change Action Plan for the Americas developed by conservation organizations (BirdLife International partners) from 12 nations across the region.

CODING OUR WAY TO EVIDENCE-BASED DECISION MAKING: THE ROLE OF DATA VISUALIZATION

Samantha Cheng, National Center for Ecological Analysis & Synthesis; Caitlin Augustin, Kaplan; Julien Brun, National Center for Ecological Analysis & Synthesis; Neal Haddaway, MISTRA EviEM; Madeleine McKinnon, Vulcan, Inc.; David Wilkie, Wildlife Conservation Society

In recent years, there have been many calls for more evidence-based decision making in conservation and development. Methods that systematically identify and synthesize evidence from the literature in a way that aims to minimize bias and maximize transparency, objectivity and comprehensiveness (e.g., systematic maps and reviews) have the potential to significantly improve access to and uptake of information that is often extensive and held behind restrictive paywalls. Though these methods are becoming more prevalent, numerous studies have shown that the use of any evidence (primary or secondary research) in decision-making is still not widespread, with many practitioners relying on primarily experience. This stems in part from the continued inability to access and sort through evidence, whether synthesized, collated or not. Authors of systematic reviews and maps tend to report their data in spreadsheets and lists, which may be difficult to find and use because of its location in additional files and in non-usable formats such as PDFs.

In response to this, there has been a push to develop interactive and intuitive ways to find, explore and utilize data from systematic reviews and maps. We present two case studies of efforts to increase evidence uptake through data visualization using open access online platforms. The first case study is an online data portal and knowledge management tool created as part a systematic map on the impacts of conservation on human well-being, produced by a Science for Nature and People Partnership (SNAPP) working group (www.natureandpeopleevidence.org). The second case study is an interactive, web-based geographical information system (an "evidence atlas") created as part of a systematic map of the impacts of farming on soil organic carbon. We discuss how these tools were planned, produced and communicated, and outline the preliminary impacts of these tools on end users and other stakeholders.

CO-EXISTENCE IN A TIGER RESERVE IN INDIA: COMPLEX INTERACTIONS BETWEEN PEOPLE WILDLIFE AND FORESTS

Gladwin Joseph, Conservation Biology Institute

We unpack the dynamic nature of `co-existence' and its impacts on both people and the forests. We present the results of our published study looking at changing livelihood strategies over three-time periods from 2008-2015. This will be complemented by results from other published research on the spread of invasives, long term monitoring, and on tiger densities to argue that `co-existence' is partially successful. Both tiger numbers and the well-being of local communities appear to be stable. However, the surrounding dry deciduous forests are being choked by the invasive Lantana camara. Decline in minor forest products has also impacted the livelihood strategies of the local communities. Their agricultural practices have moved away from shifting cultivation to settled mixed crop farming, and more recently to cash crop cultivation of coffee, maize and cotton. The shift to cash crops was driven largely by wildlife depredation of food crops. The invasive-choked forest reduces forage for wild animals possibly driving them to feed on farm crops. Income from minor forest products has declined in recent years indirectly resulting in a preference for cash generating crops. Improved state-subsidized food supply has also reduced dependence on food crops. The indigenous community display remarkable social resilience by continuously adapting and diversifying their livelihoods against structural changes, and leveraged rights historically denied to them. In conclusion, co-existence works for tigers and people, but at the expense of declining forests. Unless the State invests in enlightened management of the forests that includes the local people, that allows for prescribed fires, combined with invasive removal and restoration, the health of the forests is in peril.

COLLABORATE WITH EXISTING INITIATIVES PERSPECTIVES OF IUCN EXPERTS ENGAGED IN IPBES

Laurence Perianin, IUCN; Thomas Brooks, IUCN; Philip McGowan, Policy Subcommittee, IUCN Species Survival Commission; Cyriaque Sendashonga, IUCN; Ximena Velez-Liendo, Bear Specialist Group, IUCN Species Survival Commission

In establishing the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) in 2012, the first operating principle set by the platform's government members was that it should "collaborate with existing initiatives on biodiversity and ecosystem services… to fill gaps and build upon their work while avoiding duplication". One such "existing initiative" is the International Union for Conservation of Nature (IUCN), the Members of which in turn resolved to ensure "A significant role for IUCN" in IPBES and formalized it through a broad-based partnership between the two organisations in 2016. How is this collaboration perceived to have been put into practice over IPBES' first five years of operation? Here, we analyse perspectives of experts from IUCN who have been engaged into the IPBES work programme. We conducted online surveys in 2015 and 2016 to explore their perceptions of positive and negative aspects of the engagement, as well as lessons learnt. IUCN experts engaged in IPBES appreciate the internationality and importance of the platform, the networking and learning opportunities, and the potential it holds to better disseminate IUCN information and increase IUCN policy influence. However, they also raised concerns that the IPBES work programme is too ambitious and poorly funded, and that it risks becoming competitive with IUCN and may fail to harness data mobilized against IUCN standards in appropriate ways. Experts recommended that IUCN could usefully learn from the IPBES processes for organisation of assessment working groups and mechanisms for government engagement, while suggesting that IPBES could usefully learn from IUCN expertise in stakeholder and expert engagement, as well as recognition of the breadth of expertise through IUCN. These perceptions emphasise that the collaboration between IUCN and IPBES must be a broad-based one, to ensure synergy and complementarity such that IPBES meets its mandate to collaborate with existing efforts.

COMBINING ECOLOGICAL AND ECONOMIC KNOWLEDGE TO PREVENT UNEXPECTED OUTCOMES FROM PUBLIC LANDS POLICY

Claire Runge, National Center for Ecological Analysis and Synthesis, UCSB

A key challenge for conservation is understanding how to predict the outcomes of conservation interventions in complex political, economic and ecological systems. In this case study we combine ecological and economic models to predict the impacts of public lands grazing policy on both sage grouse and ranchers across the western United States. Sage grouse have been the focus of recent conservation efforts and considerable conservation investment. Most sage grouse habitat is grazed, and the future of sage grouse is intricately woven with the future of ranching. Many ranchers rely on access to public lands to maintain profitable businesses. We find that policy to restrict grazing on just 10% of public land is likely to increase the area of sage grouse habitat converted to cropland by up to 60%, with detrimental impacts on sage grouse persistence and other species reliant on grassland and sage brush ecosystems. These results highlight the importance of integrating ecological, economic and social information when considering conservation interventions in human-dominated landscapes.

COMMUNITY CHANGE ACROSS SPACE AND TIME IN AN ANDEAN HIGH ELEVATION ECUADORIAN NATIONAL PARK

Boris Tinoco, University of Azuay

There is an urgent need to evaluate the role of secondary habitats for the conservation of biodiversity given that today they cover a large proportion of the tropical Andes and the expected effects of global climate change on biodiversity. Less understood is the influence of these secondary habitats in the stability of communities through time due to a lack of long term studies in the region. We sought to evaluate patterns of temporal change in bird species richness, abundance, and composition in three habitats that vary in the degree they have been influenced by human activities (native forest, scrub, introduced forest). We used a moderately long-term data set (10 years) from Cajas National Park, located in the Ecuadorian Andes, were data on birds was collected by employing capture/recapture methods and point counts surveys. We tested for differences in species richness and abundance among habitats and across time using mixed-effects models. Moreover, we explored changes in community composition by calculating species turnover in space and time. Bird species richness and abundance was greater in the more disturbed scrub and introduced forest than in the native forest. However, bird community composition was different among habitats, with conservation concern species inhabiting exclusively the native forest. We did not detect a temporal change in the number of species or abundance of individuals in any of the sampled habitats. Species composition trough time changed in the native forest and scrub. Our study contributes to the knowledge of the dynamics of avian communities in the tropical Andes, showing that habitat disturbance produces changes in species composition, and that there are native habitats that are experiencing changes in species composition through time. This information is critical given the extended transformation of forest in the Andes, and the susceptibility of the region to global climate change.

COMMUNITY FORESTRY: A NEW MODEL GORILLA CONSERVATION IN THE EASTERN DR CONGO

Sarah Tolbert, Strong Roots

In Burhyini, located in the Eastern DRC the rules are simple. Only take dry branches for firewood. Never cut down a live tree. For anything else, like construction wood, ask the village chief for permission. Traditional forest management here is strong and well respected. The forested landscape is made up of a mix of sacred and community forests. While the scared forests are completely off limits to the community, used only for ceremonies, the community forest is open to community use. The Mwami, or traditional chief, decides on the rules and village chiefs enforce them. The Mwami places restrictions on the use of forest resources because the "forest is life". Because of the respect for local rules, the forest remains intact and the animals inside well protected. Just last year three families of the near extinct eastern lowland gorillas were discovered in the forest. Despite the well-protected nature of this forest, and other traditionally managed areas, protected areas are still the primary option put forth to halt biodiversity loss in this region. Community forests, regulated by traditional leaders, are absent from the conservation discussion by both government officials and conservation organizations. My research, however, suggests that community forest could play a vital role in conserving biodiversity in the Eastern DRC. Based on 160 semi-structured interviews with people living within the Burhyini chiefdom and near Kahuzi-Biega National Park, as well as with traditional chiefs, and local government officials, I argue that the government, instead of expanding its network of protected areas, should build upon traditional management and use community forests as a way to expand conservation areas. I also explore how these local institutions instill an environmental ethic towards resource conservation that is absent in

communities around the nearby Protected Area. I contend that the only way to conserve the Grauer's gorilla is through community forestry.

COMMUNITY MANAGEMENT OF JAGUARS AND PUMAS: MULTI-STAKEHOLDER PROCESSES AND METHODS

Ronit Amit, Programa Gente y Fauna; Susan Jacobson, University of Florida; Natalia Valverde-Zúñiga, Programa Gente y Fauna

Empowering and supporting rural communities in solving conflicts with wildlife is a necessary step to confront the environmental challenges facing society today. In 2015, we advanced in this effort bringing together more than 158 participants in a participatory structured communication process. The goal was to design incentives for enhancing coexistence among jaguars, pumas and humans in Costa Rica at communities that suffer predation on livestock by big cats. The final product integrated 823 ideas into six types of incentives: organization of communities, mechanisms for dialogue, technical assistance based on citizen science, a green marketing label, a payment for production of biodiversity, and an assessment of financial alternatives. This plan encompassed a diversity of tools, beyond finances, that target benefits for affected ranchers and other community members, and provides opportunities for local development while resolving conflicts with wildlife. Current follow up consists on a pilot test of incentives under a quasi-experimental research design combining social and ecological indicators. All activities include community members in an active role to build on social learning processes, this is a collaborative effort with input from institutions and multidisciplinary experts. Participatory methods and techniques we adapted for our research include focus groups, varied workshop and survey modes, the Policy Delphi, the Nominal Group Technique, the Logic Framework approach, and Problem-Solution trees. We will address the assessment of legitimacy of participatory processes, i.e., their validity, through measurements of consensus, support, satisfaction, engagement and representativeness. By focusing in our methods, we expect to offer a template for reducing human-wildlife conflicts with multi-stakeholder processes.

COMPARATIVE PUBLIC ADMINISTRATIVE (CPA) ANALYSIS A NOVEL TOOL FOR TRANSBOUNDARY CONSERVATION

Krista Lyons, Boise State University

Many large mammal species, such as the *Loxodonta africana* (African elephant) and the *Panthera leo* (African lion), have expansive ranges across multiple countries necessitating transboundary conservation approaches. Due to differing national political systems, however, a wide range of intragovernmental wildlife management and conservation strategies and philosophies exist across countries posing complex conservation challenges. An important preliminary step to addressing these transboundary challenges is a better understanding of how each of these countries formulates and implements its wildlife management and conservation policies, and which stakeholders are most influential. This exploratory study utilizes a conceptual comparative public administration (CPA) framework to compare wildlife management and conservation strategies of five diverse countries –Australia, China, Kenya, Russia, and the United States – to better understand the potential challenges for the formulation and implementation of transboundary conservation initiatives. Comprehension of such challenges is useful knowledge for adaptive management. Results of the CPA analysis include differences in political institutions, ease of policy development and/or implementation, cultural implications, wildlife "ownership", conservation funding mechanisms, incentives for conservation, local benefit sharing, policy regarding wildlife-human interactions and compensation for wildlife caused damages, and information asymmetry. Specific findings are highlighted for each country. This exploratory study ultimately illustrates the utility of CPA framework analysis as a novel tool for conservationists, wildlife managers, and other stakeholders for illuminating transboundary conservation challenges and developing new strategies for transboundary conservation.

COMPARING IMPACTS OF THREE PAYMENTS FOR WATERSHED SERVICES PROGRAMS IN CHIAPAS, MEXICO

Kelly Jones, Colorado State University

Payments for environmental services (PES) have become a popular approach for addressing deforestation in Latin America. Unfortunately, evidence about the impacts of PES programs on environmental or socioeconomic outcomes is still weak. Even less is known about how different design features of PES, and the contexts in which they are implemented, impact observed outcomes. This study utilizes 300 household surveys and counterfactual impact evaluation methods to assess PES outcomes across three different PES program designs in Chiapas, Mexico. Specifically, we compare the top-down, national PES program to two versions of decentralized, local level PES programs. We measure perceptions of PES benefits and fairness, changes to agricultural and conservation practices, environmental knowledge and information, and changes in household assets and quality of life. Matching

is used to create similar control groups across households enrolled in the different programs, and differences in outcomes are estimated through ordinary least squares regression and difference-in-difference methods. Preliminary results suggest larger impacts and more favorable perceptions in the decentralized PES approaches, but little difference across the two decentralized programs. This research contributes to our theoretical understanding of whether PES programs can (1) motivate additional changes to land use practices that in turn lead to changes in environmental service provision, (2) have positive effects on human wellbeing outcomes, and (3) influence environmental knowledge and practices that may lead to longer-term impacts. Additionally, it provides insight on how program design features influence program outcomes, and the tradeoffs across these outcomes.

COMPARING TWO METHODOLOGICAL APPROACHES USED TO QUANTIFY THE EFFECTIVENESS OF PROTECTED AREAS

Julien Terraube, University of Helsinki; Guillaume Blanchet, University of Sherbrooke; Mar Cabeza, University of Helsinki; Johanna Eklund, University of Helsinki

Biodiversity is being lost at unprecedented rates, while protected areas (PA) remain an essential strategy to prevent further losses. However, the success of this conservation approach is being compromised by external pressures calling for systematic quantification of their conservation outcomes. In part, the positive outcomes of PAs could result from a location bias, rather than their effect per se. Recent studies accounting for biases arising from these confounding factors (geographical, topographical, sociopolitical) have highlighted that protected areas may not be as efficient as previously thought. Such assessments have resulted from the introduction of matching methods to assess the effectiveness of PAs, allowing to pair treatment and comparison units with the same observable characteristics. We have developed a new method based on the counterfactual approach, comparing each sample point from inside PAs to a set of similar points instead of a single "best match" as used in the matching methods. By partitioning the environmental space and allowing for parallel computing, this new methodology allows bigger sample sizes at finer resolution than what have been used in the other methodological approaches so far. Here, we compared these two approaches, i.e., the traditional matching methods vs. the new methodology, to assess how they influence estimations of the real effect of land protection. To that end, we used deforestation data from Madagascar to assess the effectiveness of state-managed protected areas in halting forest loss over two-time periods (1990-2000 and 2000-2010) and three ecoregions (humid, dry and spiny forests). Our results highlight interesting differences in terms of computational time, spatial and temporal variations in the magnitude of PA effectiveness and provide a crucial reassessment of available methodological tools in conservation science.

COMPARISON OF SPECIES COVERAGE OF COMMUNAL, PRIVATE AND STATE RESERVES IN PERU

Sam Shanee, Neotropical Primate Conservation

Protected areas (PAs) are a conservation mainstay and are arguably the most effective conservation strategy for species protection. As a 'megadiverse' country, Peru is a priority for conservation actions. Peruvian legislation allows for the creation of state PAs and private/communal PAs. We evaluated the effectiveness of both kinds of PA at protecting Threatened species and ecoregions in Peru. Peru's state PA system totals 217,879 Km² and private/communal PAs cover 16,588 Km². Of the 477 species of Threatened and Data Deficient terrestrial vertebrate species we evaluated, 76 % had distributions that overlapped with at least one PA. Mammals received the best coverage followed by birds. Species coverage was 69 % and 50 % for state and private/communal PAs, respectively. There are 119 species only covered by the national PA system and 30 species only covered by private/communal PAs. Of the 17 terrestrial ecoregions found in Peru all are represented in PAs. The national PA system included coverage of 16 and private/communal PAs protect 13. One terrestrial ecosystem is only protected in private/communal PAs, whereas four ecoregions are only covered by the national PA system. Our results show the important role private/communal PAs can play in the protection of ecological diversity. This is particularly true for those species whose distributions are restricted to areas of high human population density where the creation of extensive state PAs is not practical. Facilitating legal mechanisms to reduce government requirements will substantially ease the burden on local stakeholders who undertake conservation projects. Similarly, conservation funders should ease application procedures to facilitate access to the necessary resources, particularly for long term management.

CONFLICT AND CONSERVATION EFFECTS OF A SHIFTING HERBIVORE COMMUNITY AFTER CIVIL WAR IN MOZAMBIQUE

Jennifer Guyton, Princeton University; Tyler Coverdale, Princeton University; Joshua Daskin, Princeton University; Tyler Kartzinel, Brown University; Johan Pansu, Princeton University; Robert Pringle, Princeton University

Large mammal (LM) loss can have cascading effects on ecosystem function, and promoting their recovery is a crucial conservation goal. But mechanisms governing LM community reassembly during large-scale restoration are poorly understood; reassembly following defaunation is rare, as are opportunities to conduct controlled experiments to understand underlying biological mechanisms. Gorongosa National Park, Mozambique, offers a unique opportunity to do this. From 1975-1995, civil war reduced LM populations >90%, but the Gorongosa Restoration Project is working to restore the park from 2004 through 2054. While most LM populations remain low, one species—waterbuck (*Kobus ellipsiprymnus*)—exploded from 3,500 pre-war to ~45,000 in 2016. With predators scarce, the population may grow until it is resource-limited; this resource exhaustion may inhibit recovery of other herbivores. A critical habitat for waterbuck and other herbivores is the Lake Urema floodplain. Previously, grazers amassed on grass-dominated lawns (~60% grass, ~35% forb cover) made productive by annual floods, but resurveys of vegetation plots monitored pre-war show forbs now dominate (~40% grass, ~55% forb). Using a replicated large-herbivore exclosure experiment, we aim to test the hypothesis that this shift is a short-term effect of asymmetric reassembly of herbivore communities, specifically the waterbuck boom. In exclosures we found a 9.4% forb decrease and an 18.5% grass increase over one year. This effect strengthens through the dry season, suggesting resource exhaustion. Foraging data from GPS collar-cameras show waterbuck select now-rare grass species. These results indicate that the waterbuck explosion is causing a plant community shift, and that ecological experiments, both natural and designed, are a useful tool to predict management outcomes. In this case, decreasing herbivore pressure by reducing waterbuck herds could restore the floodplain to a grass-dominated state within one rainy season.

CONNECTIVITY IN A FRAGMENTED LANDSCAPE A TALE OF TWO SPECIES

Prachi Thatte, National Center for Biological Sciences; Aditya Joshi, Wildlife Conservation Trust; Kaushal Patel, National Centre for Biological Sciences; Uma Ramakrishnan, National Centre for Biological Sciences

Habitat loss is the major cause of population decline in most mammals. Large area requirements and longer generation times make large mammals especially vulnerable to habitat fragmentation and isolation. We examined connectivity of two large mammals- tigers and sloth bears in the central Indian landscape. Once considered a stronghold in terms of distribution and abundance of mammals, the central Indian landscape has been undergoing rapid land-use change due to anthropogenic development over the last few decades. We used microsatellite data from non-invasive samples (Tiger: 116 individuals, 12 markers. Sloth bears: 196 samples, 11 markers) to examine genetic differentiation and used this genetic data to infer the resistance-to-movement across different land-use types. We find that both tiger and sloth bear populations show sub-structuring in the landscape. However, sloth bear populations show lower genetic differentiation compared to tiger. Dense human settlements and high traffic roads were found to offer maximum resistance to tiger movement and other land-use types including low traffic roads and agricultural fields offer very low resistance. Sloth bears seem less impacted by landscape. However, they do show a mild but significant isolation by distance. We carried out spatially explicit genetic simulations to understand whether the differences in the landscape resistance alone can lead to the observed differences in the genetic differentiation between the species. Results suggest that the demographic history of the two species in recent past (timing and magnitude of population decline) also contributes to the observed genetic differentiation. Such research is essential in understanding how different species are impacted by fragmentation in the same landscape context. Our results can be used to prioritize conservation efforts in a rapidly developing landscape, providing a link between science and management.

CONSEQUENCES OF INDIVIDUAL HETEROGENEITY IN REPRODUCTIVE OUTPUT IN A LONG-LIVED ITEROPAROUS PLANT

Matthew Tye, Uppsala University

Clarifying the causes and consequences of among-individual variation in life histories is fundamental to understand both short-term population dynamics and long-term evolution of life history traits. We used 32 years of data for the perennial orchid *Dactylorhiza lapponica* to examine variation in past allocation to reproduction and its consequences for population dynamics and fitness, in terms of population growth rate. Data are collected from two contrasting land-use regimes (traditional mowing vs. unmanaged) in each of two climatic regions (coastal vs. inland) in central Norway. Specifically, we examine how past reproductive output affects future reproductive output, how reproductive trade-offs depend on land-use regime and climatic region, and how this translates into variation in population growth rate. We find little evidence for trade-offs between the frequency and intensity of reproduction, indicating that a major part of individual heterogeneity in life history reflects variation in resource

status rather than variation in reproductive strategy. However, we find that both time since previous flowering and flowering intensity show strong interactions with site and land use. These results increase our understanding of how changes in land use may affect the fitness of long-lived individuals over a greater part of their lifecycle and can further elucidate the conservation implications of future changes in land use and composition.

CONSERVAMOS LA VIDA: ANDEAN BEAR CONSERVATION AT THE LANDSCAPE SCALE

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The conservation of a large carnivore, such as the Andean bear, often require conservation planning and actions well beyond the PA boundaries. WCS and Parques Nacionales de Colombia identified five Andean Bear Conservation Units in Colombia, based on biological and socio-economic criteria, and conservation opportunity. The Tatama-Farallones de Cali-Munchique landscape, with an estimated area of 11860 km2, is the main conservation unit for the Andean bear at the Western Range of the Colombian Andes. To conserve Andean bears in this landscape, an unprecedented conservation project was developed as a public-private alliance, with an initial five-year duration, involving Parques Nacionales de Colombia, Wildlife Conservation Society, Fundación del Grupo ARGOS, Corporación Autónoma Regional del Valle del Cauca, Smurfit Kappa, CELSIA, EPSA, and Fundación Santo Domingo. The project is divided in four phases: diagnosis, agreements, implementation and monitoring. Within the 11860 km2, we selected 4170 Km2 as our operational working area. Through field work we determined an overall occupancy of 0.74 (EE. 0.06), and we identified free ranging cattle and the habitat loss as are the main factors decreasing the occupancy of Andean bears. We also identified the productive activities, and their location, that are vulnerable to Andean bear attacks, as well as the areas where attitudes towards bears are negative. Based on these findings the goal of the project is to maintain the actual occupancy of the species by conserving or increasing the actual wilderness forest cover and connectivity, and reducing human-wildlife conflicts through management interventions focused on the improvement and/or change of productive practices.

CONSERVATION AND CATTLE PRODUCTION: IMPROVING THE MATRIX THROUGH SILVOPASTURE

Lillian Kline, University of Michigan

Agriculture shapes landscapes with important ecological and social implications. Globally, Tropical Dry Forests (TDFs) have historically been disproportionately subject to agricultural conversion. Much of conservation research focuses on forest fragments while our study aims to understand how a high-aquality matrix can benefit both biodiversity and farmer livelihoods through connectivity and provision of ecosystem services. The objective of this study is to assess how silvopasture can enhance the conservation value of disturbed TDF habitat while also benefiting local ranchers. We collected data during the summer of 2016 throughout 17 cattle ranches in Nicaragua's Rivas Isthmus where ranching is the dominant agricultural land use. We studied the ways in which isolated trees influence bird use, pasture quality, and cattle health, as well as rancher perceptions. We documented 130 trees of various species and sizes, 7 main behaviors of 29 bird species in these trees, and the temperature and weight of 116 cattle. Trees with wide canopies, mature fruits, and lower leaf densities experienced significantly higher bird visitation rates. Preliminary results indicate that while pasture growth is lower under trees, measured nutrient quality is higher. The effects of tree cover on cattle health will also be discussed. This study supports the argument that improved tree cover in pastoral systems can enhance their conservation value for resident birds without detriment to agricultural productivity. Today's agricultural practices will likely predict the future of tropical biodiversity. Sustainable land management techniques are therefore crucial to maintaining rich biodiversity, as well as thriving local populations.

CONSERVATION AND MANAGEMENT IN AMAZONIAN PROTECTED AREAS BY PARTICIPATORY BIODIVERSITY MONITORING

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Biodiversity and Protected Areas (PA) can best be conserved when local people are motivated to do so. There is an urgent need for effective, community-based conservation frameworks to safeguard biodiversity. Our goal is to develop a major participatory monitoring program in PA of the Brazilian Amazon to improve people engagement in PA conservation and their management. We created a four-step framework for the monitoring program. 1) Articulation and Mobilization: We selected eight Protected Areas to implement the project and realized 37 meetings and workshops to engage local NGOs, PA managers and local communities. 2) Construction of the monitoring protocols: Biome monitoring protocols were designed jointly by policy makers and researchers, implemented in seven PAs, and focus on biological groups that may show changes at an ecosystem level – birds, mammals, butterflies and woody plants. For seven PA, managers and local people chose locally-specific targets, focusing on PA and resource management – Brazilian nuts, aquatic turtles, peacock bass fishery, sustainable hunting and mammal in sustainable logging areas. The data collection protocol was designed by specialists and validated by local people and PA managers in meetings and workshop with 836 participations. 3) Capacity-building: We held 16 training courses for local people on participatory monitoring, with 475 participations, in which 209 people participated as biodiversity monitors. 4) Data collection: Thus far the program has recorded 2729 birds and mammals, 6394 butterflies and 1756 woody-plants, 54 Brazil nut trees, 775 aquatic turtles, 4442 peacock bass fished, 1351 records of sustainable hunting and 882 mammals in sustainable logging areas. Community-based conservation is a promising idea, deeply rooted in participation. Over time we believe that application of the proposed framework will lead to an enhancement of biodiversity knowledge and local participation in management and conservation of the Amazon.

CONSERVATION AND SUSTAINABILITY STATUS OF OPHIOCORDYCEPS SINENSIS IN THE HIMALAYA, INDIA

Pramod Kumar Yadav, Centre for Integration of Conservation and Developmental Accountability

The caterpillar fungus (*Ophiocordyceps sinensis*) is a flagship species of the Himalaya and is one of the world's most expensive natural medicinal resources. This study assessed harvesters' perception on abundance, sustainability, ease of harvesting, and challenges regarding collection in the Nanda Devi Biosphere Reserve. The annual harvest (number of caterpillar fungus per household) varied from 300 to 1150 (mean 599.31, SE ±10.19) in 2011; in 2015 it dramatically fell down to 200-710 (mean 405.93, SE ±6.06). On the other hand, average daily collection per person was 11.51 (SE ±0.37) in 2011 and it dramatically decreased to 3.57 (SE ±0.09) in 2015. With the gradual increase in the market value of caterpillar fungus since 2006 to 2015, the dependency of local communities is becoming more prominent on the income generated through its collection, whose livelihoods were earlier based on pastoral and agricultural activities. The harvesters' perception concluded that abundance (~82 per cent) and sustainability (~68 per cent) of the harvest of the species have decreased and the ease of harvesting (~78 per cent) has become difficult in the last five years. Unsustainable and rampant harvesting practices are causing threats to long term survival of this caterpillar-fungus parasitic complex along with the destruction of its habitats which support many rare, endangered and threatened Himalayan species. The fungus population and per-capita harvest are decreasing continuously. It is also found that abundance and sustainability of the harvest have decreased, and ease of harvesting has become difficult in last five years in the study area. The reasons may be over harvesting and ecological threats due to anthropogenic pressure. The regulation of rampant exploitation and implementation of scientific sustainable harvesting should be carried out for the survival of the species and to conserve pristine alpine meadows

CONSERVATION BENEFITS AND CHALLENGES OF URBAN SACRED NATURAL SITES

Alison Ormsby, University of North Carolina Asheville; Wendy Jackson, New Zealand Department of Conservation

Urban sacred natural sites are not well documented or understood, even though they are potential repositories of biological diversity and critical components of local and indigenous tradition and cultural patrimony in urban areas. Virtually all research on and activity in sacred natural sites thus far has focused on sites in non-urban areas, and most attention to sacred sites in urban areas has been on human-built heritage and structures. Minimal attention has been given to sacred natural sites that are in urban areas. These urban sacred natural sites may be connected to mainstream religions, or may exist where cities have developed on indigenous land and associated sacred spaces. This presentation will outline findings of a preliminary survey of urban sacred natural sites, introduce themes related to these sites, and identify areas for further research, including: undertaking inventories; assessing biological features and their possible contributions to conservation; assessing the possible contribution of these sites to wider strategies; examining possible management and protection options; and promoting linkages to relevant global initiatives.

CONSERVATION GENOMICS OF TUTURUATU, AN ENDANGERED NEW ZEALAND ENDEMIC SHOREBIRD

Ilina Cubrinovska, University of Canterbury; Tammy Steeves, University of Canterbury

The ultimate goal of captive breeding for translocation programmes for threatened species is to prevent extinction by ensuring species have sufficient genetic diversity to adapt to environmental change. A common challenge for these programmes is determining how best to supplement captive populations with wild individuals so that genetic diversity is maximised in captivity and in the wild. One such threatened species currently facing this challenge is the endangered tuturuatu (New Zealand shore plover, *Thinornis novaeseelandiae*). Once widespread across New Zealand, this endemic bird is now confined to a single self-sustaining wild population on Rangatira/South East Island in the Chatham Islands, two small translocated populations on predator-free islands (Motutapu and Waikawa), and a captive breeding for translocation population held jointly at the Isaac Conservation Park and Pukaha Mount Bruce National Wildlife Centre. The extent of genetic differentiation between, and the levels of genetic diversity within and between, captive and wild tuturuatu populations are unknown. Therefore, it is currently difficult to assess conservation genetic management strategies to reduce extinction risk. Here, we present preliminary genomic results based on thousands of independent genome-wide single nucleotide polymorphisms (SNPs) that suggest genetic lineages found in the wild populations may be underrepresented in the captive population. These data are being used to inform the conservation genetic management of tuturuatu, including whether sourcing additional individuals from the wild will bolster genetic diversity in the captive population.

CONSERVATION MEDIA CRAFTING POWERFUL STORIES THAT ILLUMINATE AND EXPAND YOUR IMPACT

Adam Spencer, Round River Conservation Studies

As conservationists, we dedicate our lives to fight. We fight to protect biodiversity, the astounding tenacity of evolution, and the human right to a healthy environment. We negotiate economics and navigate politics to create sustainable solutions for the planet. We are central characters in the greatest story Earth has ever known; yet we are losing the battle to communicate the urgency of our mission. To win this fight, we must change the way we tell our story. In this talk, I'll share inspirational examples of conservationists who've made greater impacts in their field by crafting powerful stories. Biologists, researchers and project managers can balance their demanding responsibilities with straight-forward communication strategies, creating cost-efficient opportunities that improve their relationships with local stakeholders, persuade policymakers, and broaden their fund-raising potential. I'll show how they can achieve their communication goals with clear, actionable media strategies. I'll share replicable advertising campaigns, tips to efficiently manage social media accounts and create shareable photo essays. I'll teach a storyboard template that guides even the technically-challenged to create short videos clarifying their goals. I'll provide a guide to translate publications into palatable news stories, and share contacts of journalists and production companies who can distribute news of SCB members to greater audiences. I aim to empower conservationists to be more vocal about their work. We must share our success stories, create productive dialogues with local stakeholders, and connect to the humanity within policymakers. My presentation will ignite the urgency our tremendous challenge demands, provide clear venues for action, and spur partnerships to continue inspiring our allies.

CONSERVATION PLANNING AND SYSTEMATIC LITERATURE REVIEWS FOR PRIVATE LAND CONSERVATION IN URUGUAY

Gonzalo Cortés Capano, University of Helsinki; Lucía Bartesaghi, Sistema Nacional de Áreas Protegidas; Enrico Di Minin, University of Helsinki; Mariana Ríos, Sistema Nacional de Areas Protegidas; Alvaro Soutullo, Centro

Universitario Regional Este; Maria Szephegyi, DINAMA; Tuuli Toivonen, University of Helsinki

Aichi target 11 of the Convention of Biological Diversity promotes the expansion of the protected area network to 17% of all terrestrial land by 2020. With limited resources available for protected area expansion, meeting international targets for biodiversity and ecosystem services conservation requires countries to engage private landowners and communities in alternative conservation actions. There are different strategies to promote private land conservation (PLC), including involuntary strategies (e.g., imposed restrictions) and voluntary tools (e.g., non-monetary conservation actions). In Uruguay the National Protected Areas System covers only ~1% of the land, while more than 90% of the land is privately owned. Using spatial conservation prioritization, we identified most important landowners to engage in conservation actions at the national level. As no previous study identified which are the most important strategies to engage such landowners in Uruguay, we carried out a systematic literature review to assess the evidence on success, constraints and opportunities of different PLC strategies developed worldwide. We made a comprehensive search for scientific articles that involved PLC and the most important policy instruments related to its promotion. We then conducted text content analysis of the resultant database, which helped identify topic clusters and highlighted the geographical distribution of such clusters. Our database consisted of 279 articles. Most of the studies (78%) were conducted only in four countries (United States of America, Australia, South Africa and Canada). Keywords clusters focused mainly on incentives to landowners, biodiversity and ecosystem services conservation and natural resources environmental protection. Conservation easements were the most covered strategy. Our methods and results are relevant for other South American countries where biodiversity conservation requires engaging private landowners in targeted conservation actions.

CONSERVATION PRACTICES AND VOCAL DIALECTS IN THE ENDANGERED PUERTO RICAN AMAZON AMAZONA VITTATA

Tanya Martinez, Puerto Rico Department of Natural and Environmental Resources; David Logue, University of Lethbridge

Captive breeding is a conservation strategy that often results in behavioral changes in animals born and reared in captivity. Culturally transmitted behaviors, such as learned vocal signals, are particularly prone to change because captive animals have limited opportunities to learn behaviors from wild animals. Changes in learned behavior could affect the success of reintroduction programs once captive animals are released into the wild. We tested for vocal divergence of learned calls in Puerto Rican Amazons (*Amazona vittata*). We recorded parrots from two captive populations and two wild populations, representing all extant populations of this species. We also recorded parrots that had been translocated between populations and evaluated their vocal changes over time. Fine-scale acoustic analysis revealed discrete vocal dialects in all four populations. The dialects evolved over a time span of ten to 40 years, demonstrating that dialects can evolve rapidly in managed parrot populations. Captive parrots that had frequent vocal interaction with wild parrots produced calls that were similar to wild parrot calls. Most parrots that were translocated between populations adopted the new dialect, but the time to adopt the new dialect varied among individuals. The emergence of dialects in this species likely resulted from a combination of historical rearing practices, cultural drift, and geographic separation. Managers should consider strategies to facilitate the acquisition of foreign vocal signals prior to release.

CONSERVATION STATUS OF LARGE TERRESTRIAL MAMMALS IN PROTECTED FORESTS ACROSS THE ISTHMUS OF PANAMA

Ninon Meyer, El Colegio de la Frontera Sur, Yaguara Panama; Antonio de la Torre, Instituto de Ecologia, UNAM; Helen Esser, Wageningen University; Patrick Jansen, Wageningen University

Large mammals play key roles in tropical forests but are currently threatened worldwide. A big question is to what degree protected areas are effective in maintaining these large mammals. Panama, part of the Mesoamerican Biological Corridor, is essential in allowing species movement and gene flow, but is also increasingly fragmented. During 2005-2016, we surveyed with camera-traps 17 protected forests scattered across Panama and compared the data to each other to assess if they still have intact communities of large-bodied terrestrial mammals. Moreover, we determined occupancy rates of a terrestrial mammal assemblage that included the nine largest species and that differed in their sensitivity to habitat disturbance. Based on 26,000 trap days from > 500 camera trap stations, we found that most sites had impoverished, little structurally-complex mammal communities, with few or no apex predators and large terrestrial frugivores. Occupancy analysis revealed consistent patterns of avoidance of human disturbance and forest edges by large hunted species, i.e., *Tapirus bairdii* and *Tayassu pecari*, and preference for habitats at higher elevation. Only in our most remote site, far away from any anthropogenic activity, these species favored lowland areas. In contrast,

carnivore species were less affected by anthropogenic disturbance. Our findings indicate a poor conservation status of several key mammals in Panama and show a negative impact of human disturbance on community composition, species abundance and habitat use of large terrestrial mammals. Clearly, not all the protected areas of Panama are effective in maintaining the entire mammal community and the study suggests a lack of connectivity between forested habitats. Our data provide a baseline for evaluating the success of conservation efforts to restore connectivity in several regions of Panama. Based on our results, we propose recommendations to improve the conservation of large mammals in Panama.

CONSERVING FELIDS ACROSS AGRICULTURAL LANDSCAPES IN COLOMBIA: AN INTERDISCIPLINARY PERSPECTIVE

Valeria Boron, Durrell Institute of Conservation and Ecology; Andres Link, Universidad de los Andes; Douglas Macmillan, University of Kent; Esteban Payan, Panthera Colombia; Joseph Tzanopoulos, University of Kent; Panteleimonis Xofis, Department of Landscape Architecture, Eastern Macedonia

Given the spread of habitat loss and degradation across the tropics, there is an urgent need to understand species' habitat requirements within human-modified landscapes, as well as ways to reconcile agricultural expansion with the conservation of endangered and keystone species, like the felids. We combined camera trapping and remote sensing data into occupancy modeling to study the habitat use and interactions by four sympatric felids across an agricultural landscape in the Magdalena valley of Colombia. The area includes cattle ranching and oil palm cultivation, an emerging land use in the Neotropics. In addition, to understand main drivers of landscape change and strategies to foster sustainability and biodiversity conservation, we used network analysis and sustainability assessment following interviews with stakeholders, and a literature/policy review. Robust determinants of species occupancy were wetlands for jaguars (positive effect); water proximity (positive effect) for pumas; and pasture (negative effect) for ocelots, and jaguarundis. These four felids did not display spatial segregation, hence strategies to simultaneously conserve this guild are possible even in modified landscapes. All felids were recorded on locations that averaged 50-60% natural cover, and jaguars, pumas, and jaguarundis were never recorded in oil palm areas. To align development with the conservation of top predators it is key to maintain areas of natural habitats across agricultural landscapes and targeting agricultural expansion to already-modified areas like pastures, which displayed no conservation value. Network analysis and sustainability assessment showed that both regulatory and voluntary approaches are valuable to maintain natural habitats, and achieve biodiversity conservation and wider sustainability. Lastly, it is key to focus on the oil palm sector, strengthen institutions and land use planning, and address the social inequalities that emerged from the armed conflict.

CONSERVING NEOTROPICAL FOREST BIRD POPULATIONS IN TROPICAL AGRICULTURAL COUNTRYSIDE

Cagan Sekercioglu, University of Utah; Federico Brenes, Wilson Botanical Garden; Gretchen Daily, Stanford University; Paul Ehrlich, Biological Sciences; Joshua Horns, University of Utah; Chase Mendenhall, Stanford University

Agricultural countryside covers large parts of the tropics, but the long-term capacity of tropical countryside to sustain native biodiversity is little-known. Between 1999 and 2010, we used mist nets at 19 mid-elevation sites in southern Costa Rica to sample 57,307 birds of 265 bird species. Habitats ranged from sun coffee plantations with few trees to primary rain forest. 38% of bird species preferred coffee plantations to forest, 49% preferred forest to coffee plantations and 13% were generalists that used both habitats. Twice as many populations, overall, were declining versus stable or increasing, especially in forest habitats and open coffee plantations. Although most forest-dependent species were absent from coffee plantations, 184 bird species were recorded in coffee plantations, capture numbers were higher than in other habitats, and populations of some forest species were stable or increasing. A modest increase in plantation tree cover (7% vs. 13%) resulted in the doubling of the capture rate of the most forest-dependent birds and the halving of the capture rate of non-forest birds. Small forest fragments experienced more species declines than increases, especially in birds that were resident, insectivorous, and more specialized. Seed-eating birds attained highest proportions in coffee plantations, insectivores were best represented in primary forest, and insectivorous birds in coffee plantations increased with more tree cover. Populations of northern migrants, most numerous in coffee plantations and secondary forests, did better than those of resident species. Costa Rican countryside habitats such as coffee plantations, riparian corridors, and secondary forests host hundreds of bird species and are critical for connecting the declining bird populations of forest remnants. Better integration of agricultural countryside with protected areas is essential for the long-term sustainability of the region's bird community.

CONSERVING THE LAST VIABLE POPULATION OF THE CRITICALLY ENDANGERED ATELOPUS VARIUS IN COSTA RICA

María Del Rocío Seisdedos De Vergara, ProCAT International; Diego A. Gomez-Hoyos, ProCAT International; José González-Maya, ProCAT Colombia,Sierra to Sea Costa Rica; Jan Schipper, Arizona Center for Nature Conservation & Phoenix Zoo

The Critically endangered Harlequin Frog, Atelopus varius, was considered extinct for Costa Rica in 1996. In 2008 we rediscovered a remnant population at Las Alturas Farm, Costa Rica. Since then we have studied this population and its potential threat factors. Our objective was to assess survival rate and demographic traits to implement management actions in order to avoid extinction. We carried out monthly surveys between 2011 and 2013, and during 2016. With Cormack-Jolly-Seber models we evaluated survival rates. We also estimated Batrachochytrium dendrobatidis fungus prevalence in both periods. We found that adult survival rate was similar for both periods, as well as similar to those for the species in Panama prior to the arrival of Bd. Bd prevalence was also similar in both periods (13%). However, during the first period we did not find eggs, tadpoles or froglets, in contrast to the second period where we have found tadpoles and juveniles. Juveniles have a lower survival rate (mean: 0.45±0.08) in contrast to the adults (mean: 0.79 ±0.02). This absence of young individuals in the first period and the lower survival rate in the second period may be a manifestation of an underlying low recruitment. Since Bd prevalence is similar in both periods, there are other factors driving the survival of this age group. Invasive species, such as rainbow trout, can be a potential threat for young individuals. Available evidence indicates Bd may not be the factor that most affects the population. At present, we are re-evaluating the population's survival and recruitment rates. With the new results, we will implement management actions. We are locating reproduction sites and making enclosures to avoid predation. We are also implementing a biosafety protocol to prevent the entry of exogenous Bd strains. At present we are evaluating the effect of these management actions on the demographic estimates of the species.

CONSERVING WETLAND BIODIVERSITY LANDSCAPE CONTEXT FOR REDUCING BIODIVERSITY-PRODUCTIVITY TRADE-OFF

Libin Thaikkattil Louis, University of British Columbia; Jeanine Rhemtulla, University of British Columbia

Agriculture is the most extensive global land use and a leading cause of biodiversity loss. Organic farming is advocated as a way of reducing the biodiversity impacts of agricultural intensification by reducing or completely avoiding chemical fertilizers and pesticides. Organic farming has been shown to increase biodiversity by up to 30 percent, but the magnitude of the effect varies depending on the species group and agricultural system. But organic management lower crop productivity, thereby requiring greater land area to meet production goals, although the evidence to date is mixed. In this study, we examine whether landscape context, such as forest area, can reduce the trade-off between biodiversity and productivity of organic farms, as compared to conventional farms in the same location. We compared abundance and diversity of amphibians and insects in organic and conventional rice wetlands over four districts in Kerala, southern India, from July to October of 2016. We selected 31 organic rice fields and paired each site with a conventional field in the same location. The pairs were selected to maximize variation in land cover in the surrounding landscape. We also surveyed farmers to determine average productivity of each farm. Blocked Multiple Response Permutation Procedure (MRBP) showed that species composition of amphibians and insects differed significantly between organic and conventional fields. Abundance and diversity of amphibians were significantly higher in organic fields. Insects were more abundant but not more diverse in organic fields. Preliminary results suggest that organic fields that are closer to forest patches have a lower drop in productivity than fields surrounded by cropland. Increased forest patches in the landscape may reduce the trade-off between biodiversity and productivity in organically managed fields, which could aid in designing agricultural ecosystems that maximize biodiversity.

COOPERATION, TRUSTWORTHINESS AND MOTIVATION: A MODEL TEST IN THE INVASIVE SPECIES CONTEXT

Joseph Hamm, Michigan State University; Dwayne Etter, Michigan Department of Natural Resources; Meredith Gore, Michigan State University; Adam Zwickle, Michigan State University

Creating sustainable relationships between the public and natural resource management (NRM) institutions requires trust. As in many areas of trust scholarship, much of the work addressing trust in this context has proceeded relatively a-theoretically but some research has begun the important task of developing a social scientific theory of trust in the NRM context. This research includes qualitative assessments into the factors that influence trust (e.g., Leahy & Anderson, 2008), quantitative tests of the separability of the constructs (e.g., Hamm et al,

2016; Smith et al., 2013), and theoretical discussions as to the relationships among those constructs (e.g., Sharp et al., 2012; Stern & Coleman, 2015). The current research takes an important next step for this area of research by quantitatively subjecting a context-specific model of trust that is, as yet untested, but implied by the theoretical discussions in this literature to Structural Equation Modeling. Specifically, hunters in Michigan (n = 23,954) were asked to complete an online survey in which they responded to questions regarding their perceptions of the Michigan Department of Natural Resources and their willingness to cooperate with its efforts to manage feral swine in the state. The model results lend strong support to the hypotheses regarding the precise nature of trust and trustworthiness, their separability, and the mediation of the effect of trustworthiness on cooperation by trust. The analyses further find support for an additional, novel driver of trust, namely, motivation.

COST-EFFECTIVE CONSERVATION DECISIONS IN THE FACE OF UNCERTAINTY

Stephanie Avery-Gomm, University of Queensland; Debby Crouse, US Fish and Wildlife Service; C. Drew, KDV Decision Analysis LLC; Leah Gerber, Dept Biology, Az State Univ; Gwen Iacona, University of Queensland; Richard Maloney, Department of Conservation; Jeff Newman, US Fish and Wildlife Service; Hugh Possingham, The University of Queensland; Libby Rumpff, University of Melbourne; Michael Runge, US Geological Survey, Patuxent Wildlife Research Center

Numerous tools have been developed to guide decisions about how to efficiently and effectively conserve biological diversity. A central theme is helping decision makers to cost-effectively allocate limited financial resources to maximize the benefit of conservation actions. However, a commonly stated concern about such analyses is that the quality of the data may be too poor to provide practical guidance. We argue that whether estimated from experiments, models or expert judgment, the relevant question is not whether data are high quality, but whether the decision guidance is robust to uncertainty in the data. The Project Prioritization Protocol (PPP) is an approach for guiding resource allocation decisions. Based on estimates of cost, benefit and feasibility of each project, cost-effectiveness is calculated and projects are ranked to identify a subset that will deliver the biggest return-on-investment. In the conservation sector, New Zealand and two Australian states have used the PPP to inform funding allocation among endangered species recovery plans, and we have developed a demonstration of the tool for the United States. Using data from 1350 US Fish and Wildlife Service Recovery plans, we analyzed the sensitivity of the optimal portfolio of funded plans to uncertainty in the cost and feasibility parameters. Our results suggest that that the PPP can generate useful and sensible decision guidance even when user-defined levels of uncertainty for estimates of cost, benefit and feasibility are high. These findings and conclusions are those of the authors and do not necessarily represent the views of the U.S. Fish and Wildlife Service.

CREATING ISLANDS WITHIN ISLANDS USING INVASIVE SPECIES EXCLUSION FENCING ECOSYSTEM RESTORATION

Lindsay Young, Pacific Rim Conservation; Eric Vanderwerf, Pacific Rim Conservation

Islands make up 5% of earth's land mass yet are where 80% of extinctions have occurred and support 40% of species vulnerable to extinction today. Invasive species, particularly introduced mammals, are one of the primary threats to island ecosystems and are responsible for two-thirds of island extinctions in the past 400 years. While predator control and eradications have been feasible on some islands, on larger inhabited islands, other options are being pursued to reduce predation by invasive species. Predator-proof fencing capable of excluding all mammalian pests ranging in size from mice to large ungulates has been used for 20 years in New Zealand, and more recently in Hawaii. We collected data in three of Hawaii's first predator fences built in 2011, 2014, and 2016 to measure the ecological impact and cost of managing vulnerable species using this technology. These fences cost an average of US$300/m to build (using all stainless steel) and enclosed 8 to 60 acres of coastal habitat. We eradicated predators with a combination of cage trapping (for cats and mongooses) and a first-generation anti-coagulent (diphacinone) for rodents. At the fence built in 2011, Wedge-tailed Shearwater nesting success increased from 28% to 54% and the average number of chicks fledged increased 384%. Translocation of seabirds and habitat restoration are underway in the newer fences. Plant and invertebrate species have been slower to respond to predator removal, but soil nutrients have begun to change as a result of increased seabird numbers, and anecdotal data on fruits of endangered plants indicate they have also increased. While the first fence built has had maintenance issues, design improvements have greatly reduced maintenance of the more recent fences. With careful planning, site selection, and choice of materials, predator fences can be a cost-effective method of protecting natural resources where traditional predator eradications are not feasible.

CROWDFUNDING CONSERVATION

Eduardo Gallo-Cajiao, University of Queensland; Carla Archibald, The University of Queensland; Rachel Friedman, University of Queensland; Richard Fuller, University of Queensland; Euan Ritchie, Deakin University

Crowdfunding has potential to increase and diversify funding for conservation worldwide. Yet the magnitude and type of crowdfunding support for conservation is poorly understood. Here we present the first global analysis of conservation crowdfunding, aimed at understanding its contribution to conservation. We identified all relevant crowdfunding platforms using a global database and extracted all conservation-focused projects. For each project we determined the funding raised, proponent characteristics, biodiversity realm, project type, and target taxa. We located 50 crowdfunding platforms, which have largely emerged since 2008. The US had the highest number of platforms (26%), followed by Australia, Brazil, Canada, and the Netherlands (6% each). The 504 successful projects raised US$ 3,767,127 (xΨ≒ $ 7,474) and were delivered in 40 countries across all continents. Proponents were from universities (35%), non-governmental organisations (31%), or were independent (26%). Projects have focused primarily on species (52%) and terrestrial ecosystems (22%), and less on marine (11%) and freshwater ecosystems (5%). Most projects are research (44%), primarily autecology and threats, followed by persuasion (34%), chiefly awareness-raising, and on-ground actions (20%), mainly vegetation management and building facilities for animals. Projects targeted 190 taxa, of which 45% are IUCN red listed. Despite platforms being concentrated in a few countries, crowdfunding is enabling resource mobilisation from developed to developing countries. Beyond finance, crowdfunding enables outreach and can fund novel ideas with great potential for diffusion. We also discuss pitfalls, including failure to reach financial goals, and inadvertently sending messages that traditional funding agencies can reduce their resourcing of conservation. Crowdfunding has been contributing to the global biodiversity conservation agenda and it has huge potential for expanding conservation financing.

CULTIVATION OF MEDICINAL AND AROMATIC PLANTS HAS POTENTIAL TO DECREASE HUMAN-ELEPHANT CONFLICTS

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In farmlands adjacent to protected areas, inhabited by African (*Loxodonta africana*) and Asian elephants (*Elephas maximus*), crop losses to these pachyderms are a common problem. For a peaceful coexistence of people and wildlife, new ways need to be found to repel elephants from fields. The replacement of crops, which are attractive to elephants by such, which are not attractive, might be a solution for farmers in and close to elephant habitats. We have conducted two field experiments, one in Zambia (2010-2011) and one in Nepal (2013-2014) to test the attractiveness of medicinal and aromatic plants (MAPs) compared to a control plot (maize or rice). In Zambia, we tested ginger, lemon grass, garlic and onion, in Nepal chamomile, coriander, mint, basil, turmeric, lemon grass and citronella. In both experiments elephants visited the test crop and the control plot. In Zambia maize was completely destroyed six weeks prior to its harvest time. In contrast, the test crops were only slightly damaged, mostly through trampling. In a very late state of the experiment lemon grass and ginger were consumed by the elephants in small quantities. In Nepal elephants did not consume any test crops, whereas they fed on the control crop. It can be concluded that MAPs are less attractive to elephants than maize or rice, respectively. However, even though the MAPs are less attractive to African and Asian elephants, they may not be completely unpalatable or even deterrent to them. Further, the potential yields and revenues for each MAP and the control crops were calculated, based on local market situation. In both experiments revenues from the tested MAPs would have exceeded the market price of staple crops in most cases. The selection of crops, which are less attractive to elephants, is a promising tool for land-use planning in areas facing damages by elephants. However, more detailed studies are needed, to observe long-term effects and to identify a larger diversity of unattractive crops.

DAMMING FRAGMENTS SPECIES RANGES AND HEIGHTENS FRESHWATER FISH EXTINCTION RISK

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Freshwater ecosystems harbor an extraordinary rich and endemic biota, and provide ecosystem goods and services valued at several trillion USD/year. At the same time, strong human dependence on these goods and services is driving increased pressure on theses ecosystems and the species that they support. Across the globe,

damming of waterways for hydropower, agriculture and municipal water supplies continues to be a primary pressure on freshwater ecosystems. Nearly two-thirds of the world's largest rivers were fragmented by dams at the start of the century and the remaining proportion of free-flowing rivers is rapidly declining. Despite diverse impacts from dams on freshwater ecosystems, tropical rivers are experiencing an unprecedented boom in dam construction. At the same time, knowledge about the ecology of tropical rivers and the implications of existing and planned dams on freshwater-dependent species remains limited. We evaluated fragmentation of fish species ranges, considering current and planned dams of the Magdalena River basin, Colombia. We quantified the relationship between species range and body size to establish a vulnerability limit set by this relationship. We used the vulnerability limit to explore the influence of range fragmentation on extinction risk of 179 native freshwater fish species in the Magdalena River basin. We found that both existing and planned dams fragment most fish species ranges, and splits species ranges into more vulnerable populations. Importantly, we found that migratory species, and those that support fisheries, are most affected by fragmentation. In my presentation of this work, I will discuss how our analyses offer a starting point to guide more effective conservation action to reduce impact of expanding dams on freshwater fishes and subsistence fisheries.

DEFAUNATION OF SEED DISPERSERS AND PREDATORS AFFECTS CARBON STORAGE IN TROPICAL FOREST

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Defaunation of large frugivores affects carbon storage in tropical forest. However, previous studies relating frugivore defaunation with changes in carbon storage ignore the potential compensatory effects on plant recruitment for frugivore redundancy and the decrease of seed predation pressure in defaunated communities. Based on empirical data of recruitment success within a defaunation gradient of seed disperser and predator communities in the Atlantic forest, we show that defaunation of both seed dispersers and seed predators affect carbon storage in tropical forest. The loss of large seed predators increases net seed mortality in 7 to 30 % due to an overcompensation of the activity of small rodents in absence of larger seed predators. On the other hand, the loss of large seed dispersers can be buffer by the compensatory effects of smaller frugivores in seed removal, but it is not sufficient to prevent a significant decrease of carbon stock. Indeed, the disruption of the seed disperser community would lead to a similar loss of carbon stock (-2.6%) as the disruption of the seed predator community (-2.5%). Therefore, for guarantee the success of carbon payments programs, as REDD+, they should achieve a complete vision of biotic interactions and preserve the intact seed disperser and predator communities.

DEFINING PRIORITY CORRIDORS AND AREAS FOR KEY SPECIES IN TROPICAL LANDSCAPES OCCUPANCY AND CONNECT

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Tropical landscapes harbor an enormous portion of the world´s biodiversity yet most still lacks systematic efforts for adequately plan its conservation. The Llanos is among the most biodiverse, but to date is underrepresented in protected areas, and information regarding species´ conservation status, distribution or priority schemes are still lacking. Furthermore, the Andes-Llanos piedmont is probably the most biodiverse and still lacks comprehensive conservation schemes. In order to provide scientific support for adequate conservation planning for this important area, we assessed mammal occupancy patterns using camera-traps and designed a connectivity network based on a circuitscape approach. Based on landscape, human and geographic variables, we estimated occupancy for 21 species detected and selected three, with the best supported models, and that represented different ecological dimensions, and modeled the most efficient connectivity routes on the landscape. We found that the most important variables that affect occupancy probabilities for *Puma concolor*, *Mazama murelia* and *Cuniculus paca* are natural remaining cover, distance to intervened areas, roads and human settlements, and slope and aspect; all accounting for different landscape dimensions. Connectivity routes and priority core habitats for all species significantly overlapped. We proposed a priority scheme for maintaining core habitats, ensure priority corridors and promote restoration of 15 pinch points, currently affecting continued connectivity, and that would efficiently promote a functional landscape network. Our results provide information for conservation intervention and prioritizing areas for designing functional

landscapes, especially in areas with high pressures for overexploitation for cattle/monocrops and oil; our scheme could inform where to invest conservation money, including compensation from oil activities in the area, promoting an integrated conservation-production landscape.

DEPREDATION ON LIVESTOCK BY BROWN BEARS IN THE PYRENEES FRANCE: A SPATIOTEMPORAL ANALYSIS

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One of the main factors limiting the acceptance of large carnivores worldwide is damages on livestock. The brown bear, *Ursus arctos*, faces conservation issues in the Pyrenees with a minimum of 29 individuals recorded in 2015. Assessing the spatiotemporal dynamics of predation with respect to prey availability is a promising tool to minimize human-wildlife conflicts through identifying areas where mitigation efforts should be most effective. Yet, the spatial analysis of predation risk is currently overlooked in mitigation planning. In order to fill the existing gap, we provide a spatial description of depredation by the Pyrenean brown bear on livestock in France at both the population and landscape scales. We used a database of georeferenced damage claims in the Pyrenees from 2011 to 2015. They were classified according to 3 categories: predation by brown bears, death not related to brown bear or undetermined causes of death. From 2011 to 2015, 559 damage claims were related to brown bears. Among these, 539 targeted 951 domestic animals (96%) and 20 targeted beehives (3.6%). Among livestock attacks, 99% targeted sheep and 1.76 ± 0.07 animals were impacted per attack. There was no significant difference between years on the total number of attacks ($\chi 2$= 8.97, d.f.=4, P=0.062). The spatiotemporal pattern of depredation by brown bears was assessed from intra- and inter-annual maps of pastures-located attacks. Their locations and dynamics were analysed while accounting for the spatiotemporal distribution of domestic preys, and depredation hotspots (i.e., areas of major predation conflicts) in the Pyrenees were identified. This study is the first step of a workflow toward detailed spatiotemporal analysis of bear's predation in the Pyrenees. Ultimately, this project aims at addressing human-bear conflicts by answering strong social needs such as assessing pastures vulnerability in order to focus mitigation efforts and minimize their costs.

DESIGN AND IMPLEMENTATION OF A MONITORING PROGRAM FOR A PROTECTED AREA WITH INFRASTRUCTURE WORK

Jorge Parra, Wildlife Conservation Society; Lina Caro, Wildlife Conservation Society; Edna Calpa, Wildlife Conservation Society; Francis Ramírez, Wildlife Conservation Society; Vladimir Rojas, Wildlife Conservation Society; Leonor Valenzuela, Wildlife Conservation Society; Ana Yusti, Wildlife Conservation Society;

The Headwaters Forest Reserve of the Mocoa River is located at the junction of the Andes and the Amazon basin in south state of Putumayo – Colombia. The reserve holds a representation of Amazon and Andes ecosystems which provide essential habitats for a high species diversity of fauna and flora as well as high levels of endemism. The area is currently subject to a transformation of its natural forests due to a road construction demanded by local communities living between two economic centers in the Andes and the Amazon regions. A management plan was generated to decrease the impact of forests and habitats alteration for several species in the reserve. To inform the effectiveness of the management plan, this study shows the design and implementation of a monitoring program of selected target species and their threats before the construction of the road in the reserve. First, a conceptual model was generated based on the management plan (why monitor?). Second, the conceptual model included a selection of focal species and their direct threats (current and future) which were related to the conservation strategies of the management plan (what to monitor?). Finally, the monitoring program was design based on occupancy models of the target´s species affected by the selected threats – covariables (how to monitor?). Results of the implementation showed that the Andean bear has an occupancy of 0.73 ± 0.13 and most probably is affected by habitat loss and distance to roads and human settlements. Furthermore, the Red-bellied Grackle has an occupancy of 0.96 ± 0.10 and there is a positive correlation with habitat quality. The previous analysis provides relevant information for evaluating the impact of the road construction, effectiveness of conservation and management actions and decision-making.

DEVELOPING A DNA BARCODE SCANNER FOR CONSERVATION

David Baisch, Conservation X Labs

Transnational environmental crime has become an exponential driver of species extinction in ecosystems

across the world. In response to growing wealth in emerging economies, the wildlife and illegal timber trade market now measures in the billions of dollars and threatens the survival of iconic species. This black market is disrupting natural communities, and depleting innumerable species—some to the brink of extinction. Timber and wildlife product sources are difficult to identify, particularly when turned into products such as furniture, filets, powders, butchered meat, or oils. Although DNA analyses can determine whether a seized product is derived from an illegal species, these technologies are absent where they are most needed—in the field. Our DNA Barcode Scanner Project is a collaborative effort between Conservation X Labs, Smithsonian Institution, Consortium for the Barcode of Life, WWF, Oceana, University of Washington, and others, with the goal of creating a handheld POC device which utilizes barcode sequences in animal and plant genomes. Our project is bringing together a diverse team of engineers, geneticists, and conservationists whose goal is not to make a 100% clinically accurate device, but to engineer a decision support tool: a low cost, simple to use, robust, highly modular device that allows citizens or officials to rapidly determine whether to investigate a timber or wildlife shipment more deeply or a corporate seafood buyer to detect problems in their supply chain. We need to develop a product that supports decision making and traceability in the environments where they matter – in the field, within the developing world, with the least number of steps possible, at lowest cost, with the highest resilience, and lowest complexity.

DEVELOPMENT OF A PROTOCOL TO INCREASE THE SENSITIVITY OF AQUATIC ENVIRONMENTAL DNA (EDNA MONITORING)

Breanna Caton, The University of Toledo; Daryl Dwyer, The University of Toledo; Daryl Moorhead, The University of Toledo; William Sigler, The University of Toledo; Carol Stepien, The University of Toledo; John Turner, The University of Toledo

The emerging molecular techniques of environmental DNA offer the potential to detect the species composition of an ecosystem by means of non-invasive environmental (water) sampling. Despite the radiation of eDNA research since 2008, there are still large knowledge gaps and a need for standardized methods that must be addressed before eDNA can be utilized as a wide-spread management tool. Employing the round goby (*Neogobius melanostomus*) as a model organism, species-specific cytochrome b primers were developed for a series of laboratory and field experiments to evaluate eDNA detection efficacy under local environmental conditions. The benefits of this qPCR testing protocol are: results that accurately determine environmental residence time; generation of gene sequences suitable for population genetic analysis; and decreased likelihood of false positive results from cross-amplification. This eDNA protocol is optimized for higher resolution species-specific surveys for aquatic organisms requiring time-sensitive monitoring. Potential management applications include: invasive species surveillance, evaluation of eradication efforts, monitoring the movement of populations, and environmental impact assessment surveys.

DISTRIBUTION HABITAT CHARACTERISTICS AND CONSERVATION THREATS OF RED PANDA IN NEPAL

Karl Wurster, USAID; Damber Bista, Red Panda Network;

From May 2016 to June 2016, the Red Panda Network conducted Nepal's first national red panda survey. The survey objectives were: 1) document red panda distribution in Nepal, 2) identify key red panda habitat characteristics, and 3) identify major threats to red panda and their habitat. The field survey was conducted across the entire red panda range in Nepal by 40 field biologists surveying 1,147km of transects. The survey recorded red panda presence in 23 districts and established a new westernmost distribution point in the global distribution range. The survey documented a potential loss of red panda sign two previously reported districts potentially as a result of habitat loss and fragmentation. Predictive distribution modeling, validated through ground-truthing, indicated that nearly 23,977 km2 of potential red panda habitat is available in Nepal with 70% of the total potential habitat falling outside protected areas. A habitat suitability analysis indicated nearly 8,894 km2 (37%) of the total potential habitat is highly suitable (threshold of >0.5). The habitat suitability model also identified three topographic variables (elevation, aspect, slope (p=<0.0001)) and four habitat variables (bamboo abundance, tree species diversity, availability of water and canopy cover (p=<0.0001))to have significant influence in red panda distribution. The influence of anthropogenic activities was also observed to have some influence in red panda distribution (p=0.001). Detrended Correspondence Analysis of vegetation data indicated clear differences in tree species composition between plots with presence and absence of red panda sign/sightings and identified 19 red panda habitat indicator species. Results suggest that habitat fragmentation and poaching are the major threats to Nepal's red pandas. Strategic landscape and local level efforts must be established to protect red panda habitat in Nepal.

DIVERSITY, ECOLOGY AND CONSERVATION OF BIRD COMMUNITIES OF POLYLEPIS WOODLANDS IN THE ANDES OF PERU

Cristian Sevillano, Cornell University; Amanda D. Rodewald, Cornell Lab of Ornithology

Polylepis forests of the Andes are among highest and most unique forest systems in the world, and as such, are recognized centers of endemism and diversity. Yet the forests continue to be threatened by human disturbance, fragmentation, and climate change, making it a system of high conservation concern. This research investigated (1) patterns of species richness and bird-habitat relationships across along an elevational gradient (~3,300 – 4,700 m) and (2) the bird communities association with local and landscape attributes across wet-dry seasons in five valleys of Huascaran National Park within the Cordillera Blanca range of Peru. In 2014-2015, birds and habitat characteristics were surveyed at 130 point count locations and systematically observed between points. I calculated observed and expected (ACE) species richness for valleys, seasons, and within 100-m elevational bands. Estimates of species richness exceed those of previous studies in Polylepis forest along the Andes. Species richness peaked at mid-elevations (~4,000 m) for the overall bird community, while the greatest number of endemics and threatened birds were found at ~4,300 m. Polylepis forest was a particularly important habitat that seemed to promote diversity and might provide an important refuge for species in the face of climate change. Species-habitat associations of 50 species of birds, including 13 of conservation priority, showed that birds were associated with four habitat types. Results suggest two key strategies form the cornerstones of conservation efforts: (a) protect remaining large (>10-ha) *P. sericea* forests at lower elevations and (b) maintain all relicts of *P. weberbaueri*, irrespective of size, at high elevations (>4,200 m). Population studies of priority bird species, combined with coordinated monitoring, will provide important insights into the response of bird populations to human activities and climatic changes and help to inform conservation of High Andean diversity.

DO ALTERNATIVE LIVELIHOODS REDUCE THREATS TO BIODIVERSITY CONSERVATION? A NEPAL CASE STUDY

Karl Wurster, USAID; Carolyn O'Donnell, USAID; Shant Raj Jnawali, WWF-Nepal; Netra Sharma Sapkota, USAID; Gill Shepherd, IUCN; Karolyn Upham, USAID

Many conservation and development projects make the critical assumption that improvements in target communities' alternative livelihoods will reduce threats to biodiversity conservation. A systematic review (Roe et al, 2015) of hundreds of alternative livelihoods projects determined that this link was difficult to show because most projects were too poorly devised and documented to make it possible to draw any conclusions. Conservation activities funded by the USAID/Nepal have operated for many years under this assumption. Projects have had substantial conservation impacts and have introduced many new alternative livelihoods, but had not collected sufficient data to clearly demonstrate a link between the two. With the initiation of the new Hariyo Ban II activity implemented by WWF in July 2016, USAID and WWF decided to develop a thorough methodology that will test this critical assumption. A detailed survey and sampling methodology was developed by a team of experts. Data collected includes information derived from social and environmental surveys. The objective of this presentation is to present the survey methodology and preliminary results. It will also discuss the planning and budget levels needed to design and implement a scientifically valid review of the relationship between improved alternative livelihoods and reducing biodiversity conservation threats at a large geographic scale.

DO MARINE PROTECTED AREAS BENEFIT CORAL COMMUNITIES IN THE MEXICAN CARIBBEAN?

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Coral reefs are tropical biodiversity hotspots that nourish, support and protect tropical coastal human populations worldwide. However, reef ecosystems are subject to multiple simultaneous stressors. Disease outbreaks, overfishing, destructive fishing practices, intensifying recreational use and widespread coastal development threaten ecosystem integrity. Consequently, coral reefs have experienced major declines in recent decades, particularly in the Caribbean. Implementation of Marine Protected Areas (MPAs) is a common management strategy employed to combat local stressors. MPAs seek to protect corals from direct physical damage and promote fish population recovery by regulating extractive practices. Furthermore, if MPAs include a terrestrial component then by controlling coastal development they may mediate run-off driven nutrient enrichment, a key factor contributing to reef degradation. However, MPA efficacy is highly heterogeneous due to MPA design, protection level and enforcement, in addition to spatial variability, trophic dynamics and external factors. Here, we evaluated the effectiveness of MPAs and complete No Take Zones in protecting Mexican Caribbean coral communities. In

2016 we surveyed benthic and fish communities at 49 fore reef sites. We found that mean coral and macroalgal cover were not significantly affected by level of protection. However, coral cover was related to herbivorous fish biomass and fleshy macroalgal cover suggesting that effective fish protection can enhance herbivory, suppressing macroalgae and reducing benthic competition with corals. We also found that local anthropogenic threats suppressed coral cover, likely due to the lack of regulation of substantial coastal development. While MPA deficiencies in directly tackling the detrimental impacts of global climate change are well-documented, our results suggest that marine protection has a role to play in protecting coral reefs and maintaining ecosystem function under global change.

DOES GREATER SAGE-GROUSE HABITAT QUALITY INCREASE LIKELIHOOD OF LEK EXTIRPATION?

Beth Fitzpatrick, University of Wyoming; Melanie Murphy, University of Wyoming

Research focusing on functional connectivity of declining populations would benefit conservation planning for long term species persistence. Functional connectivity, as measured by gene flow, can identify landscape characteristics that are corridors or barriers. Greater Sage-grouse (*Centrocercus urophasianus*) are experiencing population declines and habitat loss in association with anthropogenic disturbance. Patterns of landscape change and population decline is variable over their distribution. By comparing two areas of differing amount of land conversion, Northeast Wyoming and north central Wyoming, we intend to test the influence of habitat quality and functional connectivity on lek extirpation using microsatellite data. We tested isolation by distance using a mantel's test with randomization and found a stronger isolation by distance pattern in Northeastern Wyoming (observed compared to zero = 0.12; p=0.001) than northcentral Wyoming (observed = 0.06; p=0.003). Mantel's correlogram suggest a longer dispersal distance in the northeast Wyoming. Cluster analysis show more genetic clusters in the regions with more development (K=5 versus K=2). Network modelling supported increased gene flow associated with undisturbed areas of contiguous habitat and negatively associated with disturbance. Sagebrush loss due to development has the potential to isolate or create an effective barrier between leks. Increase in dispersal distance, reduced gene flow and increased genetic structure may suggest reduced habitat quality and an increased likely hood of lek extirpation. Landscape planning could benefit from using this information to inform conservation and restoration of sagebrush habitat for the benefit of sage-grouse. Furthermore, information on landscape characteristic leading to breeding site extirpations can lead to restoration and conservation practices that are focused on the sustaining wildlife populations.

DOES LOCAL EMPOWERMENT RESULT IN HIGHER SUPPORT TO CONSERVATION DECISION MAKERS?

Vera Hausner, UiT-the Arctic University of Norway; Sigrid Engen, UiT-the Arctic University of Norway; Per Fauchald, Norwegian Institute for Nature Research

Local resistance to conservation has often resulted in governance reforms intended to increase community involvement in decision-making. The idea is that through involvement local people will see protection of areas of high conservation value as beneficial also for local communities. Despite the many reforms to empower local communities in conservation, surprisingly few studies have demonstrated a higher public support for local authorities compared to their predecessors. In a recent nationwide reform, the management of protected area clusters was devolved from the Norwegian government to conservation boards composed primarily of locally elected representatives. In a survey including local residents from southern (N=440) and northern Norway (N=486) we found that 55% and 42% of the respondents were highly satisfied with the work of the local boards. The respondents were less satisfied with the consultation process and the knowledge used to inform the management of the protected areas. They requested more use of local experiences and knowledge (82%) as well as biological knowledge (81%) in the management decisions. Furthermore, the local communities diverged in their opinions about who should have the authority over protected areas: 36% preferred the local boards to continue, while 30% would replace the boards with local municipalities and 29% with the government. Respondents who supported the government and the local boards highly favored increased use of biological knowledge, whereas those that supported municipalities emphasized the local dispositional rights to land. Support for the local boards does not necessarily reflect conservation attitudes among the participants, as many of those in favor of local management preferred increased development, predator control and motorized use in protected areas. We conclude that conservation could benefit from evaluating the local perceptions of governance reform to improve management of protected areas.

DOES LOCAL VEGETATION COVERAGE OR ADJACENT LAND USE DRIVE VEGETATION DIVERSITY IN BUFFERS?

Ashlee Nichter, Bowling Green State University; Andrew Gregory, Bowling Green State University

Fragmentation, loss and degradation of natural land to human uses is the greatest threat to biodiversity. Moreover, conversion for cultivated agricultural has resulted in grasslands becoming one of the most endangered ecotypes. Traditionally, conservation has relied on bio-reserves, and most research and conservation efforts have focused on reserve areas or parks as the primary targets of conservation. However, a common attribute of anthropogenic landscapes, is the existence of remnant patches of natural vegetation found in linear landscape features (LLFs) such as ditches and field margins. Due to high interconnectivity, LLFs may be viable refugia for native biodiversity. However, continued deterioration and exotic invasion of LLF's from adjacent lands negatively impacts community interactions and local diversity, resulting in hybrid ecosystems. Few have evaluated the potential of LLF's to act as biological reserves. We measured vegetation diversity and composition of 43 LLF's and 13 reserves across northwest Ohio, USA. We found that LLF's and reserves differ in vegetation coverage, such as percent C4 and C3 grass, and percent forb ($P<0.01$). LLF's also have a greater proportion of nonnative species than reserves (52±1.6% and 30±3.6%). However, LLF's and reserves did not differ significantly in native species richness or native species diversity ($P=0.80$ and $P=0.73$). Reserves did have a significantly higher rarity weighted richness (RWR) than the LLF's (4.5±0.9 and 3.46±0.3; $P=0.04$). Analysis using hierarchical linear regression suggested that local community coverage had a stronger influence on RWR than adjacent land use ($r2=0.36$; $P<0.01$). Resultantly, we conclude that reserves are critical refugia for rare native species, but LLF's contribute more to the overall native vegetation diversity on the landscape than do reserves. Our data suggest that if properly managed LLF's might be an important conservation target to achieve regional conservation goals.

DRY FOREST ECOSYSTEM IN COLOMBIA: KNOWLEDGE GAPS BETA DIVERSITY AND CONSERVATION CHALLENGES

Gustavo Kattan, Universidad Javeriana Cali; Camilo Sanchez, Pontificia Universidad Javeriana Cali

The dry forest biome occurs in tropical lowlands with strong rainfall seasonality and four to six dry months. Dry forests (DF) are threatened by human activities such as agriculture and cattle ranching, which cause soil erosion and habitat fragmentation. In Colombia DF occurs in six regions and is poorly represented in the protected areas system. Based on a literature review, we evaluated biological knowledge gaps and analyzed implications for conservation and restoration. We also analyzed beta diversity of birds, bats and dung beetles to determine biological similarity among regions. We found 166 papers for the six DF regions of Colombia. Three-quarters of studies were published after 2000 and focused on the Cauca Valley and Caribbean regions. One-half of papers were species inventories and dealt principally with plants, birds and mammals; insects were mostly represented by ants and dung beetles. We found 72 papers dealing with conservation topics, of which 36 were on forest fragmentation and two on invasive species; these papers were regionally biased to the Cauca Valley and Caribbean regions. Only 17 studies dealt with secondary succession and plant-animal interactions. We found high beta diversity in the three studied groups, underscoring the importance of all regions for representing total DF biodiversity. Although interest in studying DF has recently increased in Colombia, current knowledge is uneven among regions and taxonomic groups. Topics critical for conservation and restoration such as secondary succession, pollination and seed dispersal are little studied. We propose ideas for a concerted research program that considers geographical and thematic gaps to conserve the full spectrum of Colombian DF.

EARTH OBSERVATIONS FOR MAPPING AND MONITORING TROPICAL FOREST CONNECTIVITY

Patrick Jantz, Northern Arizona University; Scott Goetz, Northern Arizona University; Nadine Laporte, Northern Arizona University

Signatories to the Convention on Biological Diversity commit to planning for well-connected systems of protected areas integrated into wider landscapes and seascapes. As deforestation and forest fragmentation continue to impede progress toward these targets in many tropical countries, efforts aimed at conserving and restoring forests to maintain and enhance connectivity are becoming increasingly important. Corridors between protected areas and intact forests can achieve biodiversity conservation and climate change mitigation goals simultaneously by increasing habitat connectivity and sequestering carbon. For these and many other reasons, large-scale biodiversity and landscape connectivity corridors have been implemented in several countries and the International Union for the Conservation of Nature is developing standardized guidelines for corridor establishment. Earth observations can provide consistent

and timely information to aid in planning and protecting such corridors. We present an approach that leverages Landsat derived global forest cover data to identify intact forest areas and to map and monitor connectivity changes between them and associated protected areas. The approach, which uses a random walk algorithm, accounts for multiple pathways and allows tuning of corridor width based on biological or planning considerations. Cell values within corridors contain meaningful information about the contribution of each cell to connectivity between focal areas, adding important ecological context to maps of forest cover and forest change. Corridor maps can thus augment existing forest monitoring systems. For example, Landsat based near-real-time alerts can be used to identify deforestation events that may have the largest impacts on connectivity. Corridor maps can also inform large scale planning efforts for IUCN Terrestrial Species Movement Connectivity Conservation Areas or contribute spatial priorities for National Biodiversity Strategies and Action Plans.

ECOAGRICULTURAL LANDSCAPE A CONSERVATION OPTION FOR WILDLIFE IN AN ANTHROPIZED LANDSCAPE IN MEXICO

Mónica Riojas-López, Universidad de Guadalajara-CUCBA; Eric Mellink, Centro de Investigación Científica y Educación Superior de Ensenada

The transformation of natural ecosystems has brought to a serious crisis of biodiversity conservation worldwide, for whose prevention the establishment of natural protected areas is falling short. Under this scenario different types of agricultural systems and landscapes can hopefully be tailored to suit conservation needs. Much research has been done in this direction, but mostly focused on annual crops in temperate areas of developed countries, with some tropical agrosystems at a modest second place. Vast anthropic landscapes in underdeveloped countries, especially in arid and semiarid areas have been overlooked. In Mexico's Central Plateau, agriculture and animal husbandry have caused a drastic transformation of the original landscape. One of the most typical agro-ecosystems in this semiarid region is made up of fruit-oriented orchards of nopales (prickly pear cacti *Opuntia spp*.). This perennial low-input agro-habitat with complex vertical structure provides refuge and food for at least 40% of all potential bird species and 65% of mammal species of the area, in addition to 28 native bee species and many amphibians and reptiles, including 17 or more species of conservation concern. Furthermore, these orchards are a reservoir of genetic diversity derived from wild nopal communities, which surface has been shrinking constantly. The conservation value of nopal orchards goes deep into a cultural and historical scenario, as nopal played a preponderant role for pre-Hispanic groups of the region, where exuberant arboreal nopal forests where their habitat and stronghold, and it continues to be part of the country´s identity. Thus, by focusing on a radically different type of agroecosystem than those that have been researched so far, we are convinced that nopal orchards are a strong candidate to become the center and flagship of eco-agricultural landscape management for the conservation of biodiversity and derived ecosystem services in this strongly anthropized landscape.

ECOLOGICAL FUNCTIONS OF PEATLANDS IN THE NORTHERN ANDES CAN BE MAINTAINED AFTER DISTURBANCES

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Peatlands in the alpine area of the northern Andes (páramos) are common. The wet weather and low temperatures of the páramos have allowed organic matter to accumulate during millenia. Tropical mountains in northern South America provide water for nearly 50 million people and peatlands are an instrumental part of the water cycle at high elevations. However, human activities are expanding in the páramos transforming peatlands and their surrounding landscape into pastures or arable land. Here, we investigated the patterns of carbon accumulation and greenhouse gas emissions in peatlands in two settings: intensive pasture and natural alpine. We selected two peatlands in similar geomorphological and climatic settings in the Chingaza National Park (Colombia). We estimated CO2 and methane fluxes using transparent closed chambers for 2 years. The peatland managed under the pasture regime had higher assimilation rates (-0.41 g CO2 m-2 h-1) than the peatland in a natural context (-0.36 g CO2 m-2 h-1). However, ecosystem respiration and plant primary production were higher in the managed peatland. Methane emissions were 15% larger in the non-disturbed peatland (166 kg CH4 ha-1 a-1). Our results highlight the ability of Andean peatlands to continue their ecological functions even after intensive management. However, the higher rates of assimilation and decomposition in disturbed peatlands makes them more vulnerable to climatic events that disrupt hydrological regimes or plant production rates. In conclusion, peatlands can coexist with human activities as long as climatic extremes do not force the system beyond points of no return.

ECOSYSTEM SERVICE PRODUCTION IS DECOUPLED FROM NATIVE FOREST COVER IN NOVEL PASTURES

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Novel ecosystems are assemblages of species occurring in historically novel combinations and relative abundances, as a consequence of human activities. Livestock pasture introduced into tropical forest biomes meet these criteria, and understanding how they co-exist and interact with native forest habitat patches to contribute the multiple goals of biodiversity conservation and ecosystem service maintenance is a key priority in tropical systems. We explored how landscape structure influences biodiversity and associated services in novel Neotropical pasture ecosystems through a field study of dung beetle (Coleoptera: Scarabaeidae: Scarabaeinae) and beetle-mediated waste removal service rates in 12 3-km landscapes spanning across a 10-60% forest cover gradient in the Brazilian Atlantic Forest. We quantified the evidence that ecosystem service rates increase at higher levels of native habitat cover, or alternatively that ecosystem service rates increase at higher levels of introduced pasture. We established the most appropriate spatial scale at which to model dung beetle biodiversity and ecosystem services in pasture habitats, and used generalized linear mixed models to test the influence of forest cover on dung beetle abundance and service rates, modeling forest specialist and generalist/open area specialists separately. Overall, we found exceptionally low rates of beetle-mediated waste removal in pastures across all landscapes (~ 4%/ 48 hr), with pastures supporting exceptionally low beetle abundance, and a paucity of forest specialist beetles. We found no relationship between service rates and landscape characteristics or abundance of either forest specialist or open area/generalists. These results suggest that biodiversity-mediated ecosystem services in novel tropical pasture habitats are not provided by forest species spilling over into matrix habitat and may be decoupled from conservation management activities that increase forest cover.

ECOSYSTEM SERVICES AFFECT PUBLIC PREFERENCE FOR WILDLIFE CONSERVATION

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Despite the crucial role of public preference in society, little scientific effort has been directed toward understanding public preferences towards wildlife habitat conservation. Without understanding how society appreciates wildlife habitat, policymakers, conservation groups, and landowners are unable to judge the true value of investments in wildlife habitat restoration and conservation programs. We investigated public preference for wildlife habitat conservation within the native range of the longleaf pine ecosystem in Florida, USA – a critical component of the 36th and most recently named global biodiversity hotspot, the North American coastal plain. Using survey and statistical methods, we quantitatively assessed the preferences of 1164 resident public with consideration for habitat conservation of 10 native wildlife species and 8 wildlife-related ecosystem services (direct use, indirect use, non-use benefits). We further measured how preferences for species were affected when residents were given scientific information on the potential ecosystem services provided by each species. We found systematic preferences, with residents favoring conservation for wildlife habitat associated with indirect use (e.g., supporting the ecosystem, pest reduction), followed by non-use (e.g., future bequest, existence value), which was preferred over direct use (e.g., hunting, recreation) ecosystem services. Further, we determined that scientific information about wildlife-related ecosystem services significantly elevated public preference for habitat conservation, in particular for non-charismatic species that were previously unknown or disliked. These findings make a meaningful contribution to the literature on integrating multiple services (in research and practice) – an area of critical need. Communicating the potential benefits associated with wildlife habitat conservation to the public can better align public support with conservation and habitat management goals.

ECOTOURISM FOR CONSERVATION CETACEAN VULNERABILITY TO WHALE WATCHING IN THE CARIBBEAN

Bonnie Raschke, Arizona State University

Conservation must address the conflict between the needs of humans and other species. Ecotourism is one method of doing this, incentivizing the protection of species/landscapes through tourism dollars. However, this outcome can only be attained when the protection of natural resources is prioritized. The Caribbean whale watching (WW) industry is one form of ecotourism that should be analyzed to ensure that conservation goals are attained. The region has a growing WW industry, and is an important habitat for ~34% of the world's cetacean species. WW can increase visitor support for cetacean conservation, and provide an economic alternative to whaling. It also has negative impacts on

target animals, including disruption of key behaviors. Unfortunately, research on these effects can't keep up with industry growth, so it is necessary to develop metrics for protections with available biological data and supporting interdisciplinary methods. Thus, I synthesized current WW impact and Caribbean cetacean life history data to analyze the WW vulnerability of different species, examined protective measures, and interviewed WW operators (WWO) in Dominica and the Dominican Republic to discover areas of contention. Sperm whales and costeros (Guiana dolphins) were identified as the species with the highest vulnerability. There are 11 countries in the Caribbean that included sperm whales as WW target species, and 4 countries that targeted costeros. Of these, only 36% of countries targeting sperm whales and 50% of those targeting costeros had guidelines in place for WW. Interviews with WWOs found that operators believed the target animals were not threatened by WW, and that they could tell when the whales were being disturbed. Scientific evidence does not support these perceptions. This suggests that highly vulnerable species are being targeted without sufficient protection & highlights the need to work with WWOs create improved strategies for management.

EFFECTS OF WATER TURBIDITY ON MONTIPORA SP. CNIDARIA ACROPORIDAE USING AN AQUARIA SYSTEM

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The scleractinians (stony corals) are biogenic structures of calcium carbonate that provide habitat and support for different species, including fishes of economic interest. Currently, coral reef ecosystems are suffering a decline in population sizes, reduction in biodiversity and changes in their local oceanographic conditions as a result of the impact of human activities. Activities such as farming and overfishing increase the water turbidity and sedimentation, limiting the intensity of light and having a direct effect on corals growth. Coral reef plays a key role in food security and economic prosperity of coastal communities, which represent nearly 40% of the world's population. In order to understand the effects of turbidity as a limiting factor of the light intensity available for the corals, we developed an experiment to compare the size, colour and density of *Montipora sp*. under three turbidity conditions in aquaria systems (photosynthetic photon flux density: low 25%, medium, 50%, high 100% = 7.5, 18, 35 µmol m-2 s-1, respectively). Phenotypic traits and physical conditions were measured every week for ten months. Expose colonies to the low intensity of light shown a lower develop compared with the other treatments, losing the zooxanthellae (visible bleaching) three months after beginning the experiment; followed by the colonies exposed to medium intensity after five months. Finally, those colonies exposed to the high intensity of light kept the zooxanthellae and produced new tissue until the end of the experiment. The low growth may be the result of the zooxanthellae being unable to photosynthesise in low-intensity light; therefore, the symbiosis between corals and zooxanthellae was compromised. Also, our density calculation will improve understanding of how skeleton building is affected in colonies exposed to different intensities of light. We hope that this project will mark off the importance of promoting sustainable development of local communities.

ELITE CONSUMPTION THREATENS CRITICALLY-ENDANGERED PIGEON THE CASE OF THE MANUMEA

Rebecca Stirnemann, Australian National University, SCS and Forest and Bird; I. A. Stirnemann; D. Abbot; D. Biggs; R. Heinsohn

Harvesting, consumption and trade of forest meat are key causes of biodiversity loss. To mitigate threats from hunting pressure, a clear understanding of the commodity chain, the mechanism by which the meat from hunting travels from the site of capture to the consumers table, and the drivers of consumption is required. We examined the dynamics of hunting pressure and determine how this is contributing to biodiversity loss, with a focus on two species of pigeons: the Pacific pigeon (*Ducula pacifica*) and the critically endangered Tooth-billed pigeon, also known as the Manumea (*Didunculus strigirostris*). We interviewed hunters, vendors and consumers in Samoa, as well as analyzing consumption data collected across Samoa from 2348 households. Our findings indicate for the first time how despite not being a target species, the Manumea or tooth-billed pigeon, the last remaining species in the Didunculus genus, is killed as incidental by-catch while hunters are targeting the pacific pigeon. Analysis of consumption data showed that the richest ten percentiles in the country consumed 43% of all pigeons and the wealthiest 40% consumed 80% of all pigeons. The identification of the commodity chain and main consumers offer possible points for management intervention. The insights gained from understanding the Pigeon commodity-chain in Samoa identifies key points of intervention and provides insight in dealing with elite-driven consumption, and by-catch threatening endangered species in other parts of the world.

EMPTY NICHES AFTER EXTINCTIONS INCREASE POPULATION SIZES OF MODERN CORALS

Carlos Prada, STRI; Nancy Budd, University of Iowa; Michael DeGiorgio, The Pennsylvania state university; Roberto Iglesias-Prieto, The Pennsylvania state university; Keneth Johnson, National History Museum; Nancy Knowlton, Smithsonian National Museum of Natural History; Don Levitan, Florida State University; Monica Medina, The Pennsylvania state university; John Pandolfi, University of Queensland; Cheryl Woodley, NOAA

Estimates of population size through time can show how history has shaped the evolution of current species, provide accurate models to interpret contemporary genetic data and generate a framework to implement successful conservation strategies. This is relevant when paleontological evidence is rich and provides direct ecological evidence on what triggers demographic variations. We studied how variations in abiotic and biotic environments since the late Pliocene shaped historical changes in the population sizes of corals of the genus Orbicella, the major current reef builders in the Caribbean. Our results suggest populations of all three Orbicella species share patterns of population decline around 1-2 Ma coincident with the extinction of 80 % of Caribbean coral species. The change in population size is consistent for the three species despite their ecological difference. Most recently, the two shallower specialists, *O. faveolata* and *O. annularis* expanded their population sizes by at least two folds. The expansion of these two species coincides with the recent disappearance of their sister competitor species *Orbicella nancyi* (organ pipe). Our study suggests populations of modern Orbicella species are capable of rebounding from reductions in population size under suitable conditions and the evolutionary potential for corals to adapt to climate change may be higher if one accounts for the recent erosion of genetic diversity during the recent past.

ENCROACHMENT, ILLICIT EXTRACTION, AND AVIAN BIODIVERSITY IN THE MANAS TIGER RESERVE (INDIA)

Dhananjaya Katju, Texas A&m University

Occupation of land, termed encroachment, and non-official timber extraction, considered illicit timber collection, are forms of local noncompliance with conservation laws that are considered significant threats to biodiversity hotspots. Yet conservation authorities often poorly understand the social, political, and economic drivers of local patterns of land use and land cover change, paying scant attention to biodiversity in human-use landscapes within and bordering protected areas. In the Manas Tiger Reserve, a World Heritage Site located within the Himalaya biodiversity hotspot, a cultural group, the Bodos use a mix of historical, state, and self-realized perceptions of a tribal identity to mediate encroachment and illegal forest resource extraction in the Manas landscape. Given the legal constraints of these activities, such strategic deployment of identity often occurs through violent means with unknown effects on avian biodiversity. I use ethnographically-informed research that includes in-depth interviews, household surveys, participant observation, archival research, and media studies. I also conducted systematic ornithological sampling within forested land and agricultural mosaics to evaluate the effects of culturally mediated, ethnically driven, socio-politically motivated resource uses on avian biodiversity. My findings highlight the existence of a shifting, and frequently contradictory, cultural, political, and ecological Bodo subjectivity surrounding resource use strategies. In particular, Bodo subjectivity interacts with official conservation policy and practice, as well as with similar aspirations of non-Bodo ethnic groups, to produce a social-ecological landscape with considerable avian diversity. My study is a demonstration of conservation landscapes of the future – lived-in, contested, and conflicted sites that simultaneously promote livelihoods, cultural identity, and biodiversity.

ENDEMISM HOTSPOTS AND CLIMATIC REFUGIA: IMPLICATIONS FOR CONSERVATION

Reed Noss, Florida Insitute for Conservation Science; Susan Harrison, Envir Sci & Policy;

Biodiversity hotspots of various kinds have long been considered priorities for conservation. Studies show that hotspots of endemic species richness typically perform better than other kinds of hotspots in representing overall species richness. In a time of rapid climate change, endemism hotspots are also of interest because they often coincide with climatically stable regions, although this relationship has not been rigorously studied until recently. We review evidence linking centers of endemism with climatic refugia. Mountainous terrain and proximity to consistently mild ocean currents reduce the velocity of climate change and create regional climatic refugia. These refugia both help to preserve ancient lineages (paleoendemics) and, in some cases, to promote high rates of speciation and retention of young species (neoendemics). Microrefugia, localized areas such as north-facing slopes and karstic depressions, in which changes in climate are more moderate than in the surrounding regions, are also important in retaining species when regional climates warm rapidly. These typically small areas are often missed in GIS analyses of climate change.

Recent studies suggest that historic climatic refugia will likely continue to serve this function under present and future climate change, with the key caveat that absolute rates of climate change in these refugia may still exceed the ability of some species to adapt. Identification and protection of both macrorefugia and microrefugia globally is necessary to reduce the rate of extinction of endemic species and maintain global biodiversity during a time of rapid climate change. More study is needed to determine whether endemics in climatic refugia show lower dispersal capacities or other life-history traits reflective of historic climatic stability, which could increase their vulnerability to radical climate change.

EQUITY AND ACCESSIBILITY OF CULTURAL ECOSYSTEM SERVICES FROM THE PROTECTED AREAS

Maria Martinez-Harms, University of Queensland

Experiences with nature through visits to protected areas are an important cultural ecosystem service that have the potential to strengthen pro-environmental attitudes and behavior. Understanding the accessibility of protected natural areas and likely preferences for enjoying the benefits of nature visits are key factors in identifying ways to improve the equability of access and inform the planning for future protected areas and their management. We develop, at a regional scale, a novel database of visits to protected areas in the Mediterranean region of Chile using geotagged photographs from social media and assess the equality of the visits using the home locations of the visitors. We find that 20% of the population of the region make 80% of the visits to protected areas. Wealthier people tend to travel further to visit protected areas while people with lower incomes tend to visit protected areas that are closer to home. Larger protected areas and those that are more biodiverse are the most visited. Our study has important policy implications: by providing information on the current spatial flows of people to protected areas, we demonstrate the need to expand the protected area network, especially in lower income areas, to improve equitable access to the benefits provided by nature.

EQUITY AND FAIRNESS IN PES: AN ASSESSMENT OF COMMUNAL PAYMENTS FOR ENVIRONMENTAL SERVICES IN ECUADOR

Felipe Murtinho, Seattle University; Tanya Hayes, Seattle University

This presentation examines issues of equity and fairness in Payment for Environmental Services (PES) in the context of communal resource management in Ecuador. PES is quickly becoming the policy tool of choice to promote conservation in developing countries where said programs are increasingly applied in common property lands. While proponents contend that PES is a just and effective means to achieve conservation outcomes, others raise concerns about whether participation may produce inequities within communities, facilitate elite capture of resources, and ultimately, erode the legitimacy and longstanding success of PES. Questions of legitimacy and fairness are particularly salient in communal contexts where the costs and benefits of the decision to participate and obey with PES conservation goals are likely to vary across different households. We provide empirical evidence on the potential sustainability of communal PES programs by analyzing the results from a study of Ecuador's national PES program (Socio Bosque). We use logit models from data gathered from 220 household surveys within six communities, supplemented with focus group discussions and land-use assessments to assess: (a) how the collective decision to participate in PES aligns with household participation preferences, (b) who is more likely to receive direct and indirect benefits from participation, and (c) the factors that make it more likely that a household will consider the distribution of benefits and the PES program to be fair. Preliminary results suggest that poorer and more resource dependent households are more likely to perceive that they have not received the benefits from participation. A community's organizational capacity, however, is critical in determining the decision to participate, providing for an equitable distribution of benefits, and higher legitimacy of the program. These results demonstrate the important role of communal governance for sustained conservation policy tools.

ESTIMATING RELATEDNESS IN CAPTIVE BREEDING FOR TRANSLOCATION PROGRAMMES TO ENHANCE SPECIES RECOVERY

Stephanie Galla, University of Canterbury; Marie Hale, University of Canterbury, School of Biological Sciences; Richard Maloney, Department of Conservation, Science and Policy Group; Anna Santure, University of Auckland, School of Biological Sciences; Tammy Steeves, University of Canterbury, School of Biological Sciences

Endangered species recovery programmes can utilise captive breeding for translocation as a technique to prevent extinction and enhance species recovery. Captive pairing decisions are generally based on available pedigree data to minimise inbreeding and maximise genetic diversity in an effort to maintain the ability to adapt to environmental change (i.e., evolutionary potential). However, pedigrees in captive breeding for translocation programmes are often shallow (<5 generations deep),

incomplete or error-prone. Furthermore, pedigree-based estimates of relatedness are probability-based, which means these estimates, even for perfect pedigrees, may not reflect true relatedness. While genetic-based techniques (microsatellites) offer captive breeding for translocation programmes a way to estimate genetic relatedness among individuals without a pedigree, emerging evidence indicates that microsatellite markers may be insufficient for accurately measuring relatedness, particularly in genetically impoverished endangered species. More accurate measures of relatedness should be obtained from many thousands of independent genome-wide single nucleotide polymorphisms (SNPs) because they provide greater genetic resolution across the genome. Here, we compare genetic (microsatellite) and genomic-based (SNPs) estimates of relatedness in captive kakΨ (*Himantopus novaezelandiae*), a critically endangered New Zealand endemic wading bird, where parent-offspring and sibling relationships are known. This research is part of a larger interdisciplinary effort to determine the best approach for making efficient and effective captive pairing decisions in threatened species. Using kakΨas a proof-of-concept, this effort can be used to inform roughly 400 captive breeding for translocation programmes worldwide.

ESTIMATING THE POPULATION LEVEL IMPACTS OF ANTHROPOGENIC AT-SEA THREATS TO SEABIRDS

Stephanie Borrelle, Institute of Applied Ecology New Zealand; Holly Jones, Northern Illinois University; Roberto Salguero-Gomez, University of Sheffield; David Towns, Department of Conservation

Conservation for highly threatened seabirds has predominantly focused on the removal of introduced predators from their island breeding sites. Such conservation actions have proved successful for the recovery of declining populations, and in some cases the rediscovery of once-thought extinct species. While predator eradication remains a key conservation tool, attention is turning towards the population level impacts of threats at-sea, such as plastic pollution, fisheries and climate change, and how to manage these to ensure the future preservation of seabirds. In the absence of appropriate demographic and at-sea mortality data, theoretical models can be used to explore how threats might affect the capacity of a population to replace itself. First, we examined allometric relationships for 139 seabird species to establish if relationships exist between demographic parameters and IUCN threat risk. Second, we used generalized population growth models that combine matrix models and allometric relationships, developed specifically for data-deficient species, to model maximum annual growth for 14 burrow-nesting seabirds, presumed to be experiencing optimal conditions (i.e., released from predation pressure). Third, we simulated how potential increases in mortality from threats at-sea (fisheries bycatch, climate change, plastic pollution) may affect a population through changes to adult survival using perturbation analysis. In terms of conservation, perturbation analyses provide a powerful risk assessment tool to explore how a threat, or management strategy may change a vital rate of a species (e.g., adult survival), thus the population growth rate over time. We used this method to broadly rank the risk of species to multiple at-sea threats. In the face of increasing threats at-sea to the world's seabirds, identifying species which may be more at risk can help guide future conservation management through targeted mitigation actions and conservation prioritization techniques.

ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS USED TO TREAT COMPLEX MULTIFACTORIAL DISEASES (IFUMBI)

Samuel Nshutiyayesu, University of Rwanda; Rosine Mukabarungi, University of Rwanda

In Rwanda, many people in rural areas call many of the unidentified diseases as "Ifumbi". The symptoms vary and the treatment of each of those complex diseases varies as well. The main objective of this study was to identify different diseases known as "Ifumbi" and evaluate the use of plants in their treatment. Data were collected by interviews with Traditional Healers Association in Huye, Rwanda. Results indicated that 11 different diseases are called "Ifumbi" among which dominated by gynecological and sex related disorders (64%). A total of 24 plant species belonging to 21 families are used in treating different "Ifumbi" diseases. These plants are mostly harvested from the wild (79.2%). Different parts of the plants are used for remedies' extractions, but the leaves are the most used (70%), and maceration is usually used for preparing and processing the remedies (70%), where patients take them mainly via oral routes (82%). Traditional knowledge in treating ifumbi is an important asset to build upon for further research about these complex diseases. We recommend that further investigation on identified plant species used as "Ifumbi" remedies be done in terms of composition identification and effectiveness potential for wide use and technological improvement. Traditional healers should also be provided with some training on plants science and conservation basics. This could be quite beneficial by reducing anthropogenic pressure on biodiversity. Also, the introduction of appropriate, simple and low-cost technology should be provided to these people in order to improve traditional practices efficient and healthier

EVALUATING AMERICAN ALLIGATOR HOME RANGE AND SITE FIDELITY PATTERNS IN INTENSIVELY MANAGED WETLANDS

Abigail Lawson, Clemson University; Patrick Jodice, Sc Coop. F&w Research Unit; Katherine McFadden, USGS SC Cooperative Fish and Wildlife Research Unit; Thomas Rainwater, Clemson University

Movement patterns have profound implications for both conservation decisions, and many ecological processes like species abundance and distribution, and predator-prey interactions. In the southeastern United States, American alligators (Alligator mississippiensis) are a keystone species, capable of altering habitat structure and function. Despite an abundance of existing crocodilian movement research, few studies have investigated movement patterns in altered landscapes— e.g., artificial wetlands, urban areas, or other highly fragmented habitats. In coastal South Carolina the majority of wetland habitat is man-made, in which water levels are artificially manipulated to produce food for wintering waterfowl, and often do not reflect the natural hydroperiod. In 2015, we captured and marked 24 adult male alligators with Telonics TGM 4310 GPS satellite transmitters, scheduled to acquire a location fix every three hours from April–September, and repeat the following year. We estimated daily movement rates and used kernel density estimation (KDE) to derive home range size estimates (50, 90, and 95% isopleths), and evaluated the effects of total body length and environmental variables on each parameter. We then used the utilization distribution overlap index (UDOI) to evaluate interannual variation in home ranges. Large individuals had smaller core use areas (50% KDE), but had higher daily movement rates. Core areas also had the highest degree of overlap across years, compared to 90 or 95% KDEs. Despite distinct habitat differences, South Carolina alligator home range sizes and movement rates were similar to previous studies in natural wetland systems, suggesting that in some cases, artificial habitats may not significantly alter alligator movement behavior. This study has relevant applications to other crocodilian species (in which half are endangered), particularly in areas in which water demands and development may necessitate the use of artificial or managed wetlands.

EVALUATING THE SENSITIVITY OF SPECIES IRREPLACEABILITY MEASURES TO DATA QUALITY AND GRANULARITY

Lucy Bastin, Joint Research Centre of the European Commission, Italy; Grégoire Dubois, Joint Research Centre of the European Commission; Andrea Mandrici, Joint Research Centre of the European Commission;

When assessing the adequacy and representativeness of a protected area (PA) network, some indicators assess the 'irreplaceability' of each component in the network in terms of its coverage of desired habitats or known species ranges. Statistics of this type are presented by the UNEP-WCMC's Protected Planet website and by the European Commission's Digital Observatory for Protected Areas, but it is important to give users some idea of the reliability and scalability of such indicators. Input data on species distributions and suitable habitats suffer from numerous sources of uncertainty, and protected area boundaries are often incomplete or incorrectly characterized. In this work we compare results generated from different input datasets that represent common variations in data quality and precision. Firstly, results gained using IUCN Red List polygons are compared to those from a refined subset of range polygons generated by an expert group. Secondly, we compare results obtained using reserve polygons from the World Database on Protected Areas in a region where management and ownership are contentious and authoritative data is difficult to collect, with a more complete dataset collected during public consultation. To eradicate uncertainty is impossible, given the complex political and socioeconomic circumstances under which PAs are designated and managed, and the impossibility of deriving a perfect representation of species range at any point in time. Therefore, the goal is to quantify the effects of different uncertainties, propagate them through the indicator generation process and communicate them to users so that better conservation decisions can be made. An element of this communication will include modelling and simulation of error, and visualization of the reliability of the indicators. An assessment of the relative impact of the different types of error can also help to focus data collection and cleaning by the official bodies responsible.

EVALUATION OF STRATEGIES IN KRUGER NATIONAL PARK TO EFFECTIVELY CONSERVE AQUATIC BIODIVERSITY

Helen Barber-James, Albany Museum; Alexandra Jennifer Holland, Department of Freshwater Invertebrates, Albany Museum; Hendrik Sithole, South African National Parks

Different river monitoring strategies have been used at different times over the past 50 years in South Africa. Currently the South African Scoring System version 5 (SASS5) is used at a national scale. This is a rapid biomonitoring method assessing macroinvertebrate communities by calculating sensitivity scores at family level. Although this coarse taxonomic resolution provides for easy specimen identification in the field, this method does not allow for changes in species composition, abundances and distributions to be detected. To ensure

proper conservation and management practices the national biomonitoring programme currently in place in South Africa needs to be updated. South Africa's Kruger National Park is world-renowned as one of the largest and most impressive natural reserves in Africa. The ecological health of the rivers flowing through the park is imperative for proper ecosystem functioning of all life within the park. Upstream anthropogenic activities (including forestry and associated pulp-and-paper mills, farming, sugarcane refineries, extensive mining and water abstraction) have severe impacts on their ecological integrity. Furthermore, water quality and quantity are of international importance as these rivers are shared water resources with Mozambique and Zimbabwe, thus South Africa has an obligation to manage conservation of these rivers as part of the "Revised Protocol on Shared Water Courses" in the Southern African Development Community (SADC). The SASS5 biomonitoring method is compared to a more comprehensive biodiversity assessment using macroinvertebrates collected from selected rivers flowing through the Kruger National Park. Advantages and shortcomings of both methods will be presented. The results of this work have implications for both local and national conservation strategies for freshwater biodiversity.

EVIDENCE FOR INTERRELATIONS BETWEEN WILDLIFE ABUNDANCE AND HUMAN DEVELOPMENT OVER THE LAST 20 YEARS

Judith Ament, Institute of Zoology; Chris Carbone, Institute of Zoology; Ben Collen, University College London; Robin Freeman, Institute of Zoology

The global biodiversity crisis has led to a succession of internationally agreed sustainable development targets, but to date, progress towards meeting these has been limited. A possible restraint on progress in this area is a lack of consideration of interrelations between targets. With multiple targets (even within one research area, e.g., the CBD Aichi Targets), there will be both instances of incompatibility and of synergy between targets. In broader policy agendas, such as the UN Sustainable Development Goals, these synergies and trade-offs are likely even more pronounced. Understanding these interrelations is imperative to design conservation strategies that avoid conflict with other policy aims and maximize efficiency in achieving multiple targets. Little quantitative information is available however on the magnitude and directionality of these relationships. In order to aid the process of designing a more coherent sustainable development agenda, we assessed global evidence for relationships between biodiversity measures and human development over the last 20 years. We modeled these relationships using data on bird and mammal population abundance trends from the Living Planet Database, and 40 social, economic and political indicators of progress made towards the UN Sustainable Development Goals. We implemented our analyses in a Bayesian framework, to derive credible information about model parameters even under small sample sizes. Results suggest significant positive relationships between bird and mammal abundance and a number of indicators of human development, but negative relationships with indicators of human population growth. Our results demonstrate broad compatibility of the conservation and development agendas and underline the need for further integration of sustainable development strategies. Importantly, our results suggest that the expansion of human populations, not human development per se, poses the main threat to achieving biodiversity targets.

EXAMINING THE SOCIAL IMPACTS OF MARINE PROTECTED AREAS ON LOCAL COMMUNITIES IN WEST PAPUA INDONESIA

Kelly Claborn, World Wildlife Fund; Louise Glew, World Wildlife Fund; Michael Mascia, Conservation International; Phillip Mohebalian, World Wildlife Fund; Fitryanti Pakiding, University of Papua

Marine protected areas (MPAs) are an integral component of local, national, and international strategies for fisheries management and biodiversity conservation. Though the benefits of MPAs for ecological conservation and biodiversity are well-studied and generally accepted, their contribution to the well-being and livelihoods of local community members remains largely unknown. To cultivate lasting and just marine management procedures, both the social and ecological impacts of MPAs must be evaluated and considered in decision-making. Therefore, since 2010, we have explored the social impacts of MPAs on local communities as part of a longitudinal collaborative study in the Bird's Head Seascape in West Papua, Indonesia. Using household surveys, we measure human well-being across five domains (economic well-being, health, political empowerment, education, and culture). We apply a quasi-experimental matching technique to estimate MPA impacts on human well-being, comparing households in six MPAs to similar non-MPA control households. Across the Seascape, MPAs have positive short-term impacts on economic well-being, food security, and school enrollment rates for the average household, but negatively impact political empowerment. We detect substantial variation in social impacts among MPAs, as well as between different social groups (e.g., fishers vs. non-fishers). For example, Kaimana and Selat Dampier MPAs generate a greater positive impact on economic well-being and food security relative to other MPAs in the

Seascape. With this initial look into the short-term social impacts of MPAs, we begin to inform MPA planning and implementation practices not only for what is best for the environment, but also for those who depend on it.

EXOTIC SPECIES PATHWAYS STRATEGIES TO MOVE FORWARD IN THEIR CONTROL AND IDENTIFICATION

Maria Baptiste, Instituto Alexander von Humboldt; Lina Garcia, Instituto Alexander von Humboldt; Carolina Castellanos, Instituto Alexander von Humboldt

Invasive species are one of the major threats to biodiversity and the structure and functioning of ecosystems; precautionary measures had shown to be a more effective strategy. Exploring the mechanism behind the likelihood of arrival of biological invasion turns into a key element for their management and has been underlined as a global priority by Aichi target 9, which states that by 2020 invasive alien species and pathways should be identified and prioritized. About 297 exotic species have been introduced to Colombia; however there had been progress in addressing the biological invasions by producing a National action plan among other technical documents to support decision-making. Even so, information regarding high risk pathways for exotic species of fauna and flora is scarce and split, a consequence partially from responsibilities and competencies divided amongst different institutions at the intergovernmental level. To understand this factor, the Humboldt Institute has been directing efforts to consolidate information related to importation of goods and services, as well as academic information from different institutions that allow us to analyze the available information in the light of categorization framework adopted by the CBD. Although the country does not have a standardized information database on the introduction pathways of exotic species, a preliminary analysis for plants show that from 35 high risk species present in Colombia, a 90 percent have been introduced intentionally by release, escape and stowaway. Few cases were found as unintentional introductions (unaided and corridor). To prioritize management actions, one of the main gaps we have identified so far is the lack of clear and harmonized normative for addressing stakeholders in develop approaches for risk assessment of pathways and to determine transport routes, bilateral markets, population densities and human influence on ecosystems.

EXPERIENCING NATURE IN A POST-BIODIVERSITY WORLD

Richard Fuller, University of Queensland

A scientific consensus is emerging that experiences of nature provide an enormous range of benefits to human health and well-being. It has also been suggested that nature experiences are important in prompting a person to feel concern for the environment and to take conservation action. Yet, as the world's population has become increasingly urbanized, the quantity and quality of our experiences with nature have declined enormously in the past few decades. This has potentially harmful consequences for human well-being, and for our collective desire to conserve nature. Unfortunately, the science underpinning this topic is scattered, often inconclusive, and heavily biased toward certain aspects of the problem. In particular, the link between nature experiences and conservation concern remains unproven. In this talk I will consider how our experiences of nature are changing, explore the causes of these changes, and the consequences for human well-being and conservation concern. There will be brief injections of real data from our studies in Brisbane, Australia.

EXPLORING ATTITUDES AND PREFERENCES TOWARDS SPECIES AT RISK IN BRITISH COLUMBIA

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There are 199 species at risk in British Columbia (B.C.). To elicit public support to conserve biodiversity, it is important to understand people's attitudes and preferences toward species at risk. We applied research methods from psychology to examine how people perceive endangered species in B.C., how message framing shapes people's attitudes toward the species, and whether implicit or explicit preferences determine intended donations to conservation. In Study 1, we presented three messages about sea otters to 623 university students in Vancouver, and measured the change in their attitudes toward sea otters using Kellert's typology of basic attitudes toward wildlife. The messages were framed as either positive (as a keystone species), negative (resource conflict with First Nations' fishermen in the West Coast of Vancouver Island), or neutral (biological facts). We found that the negative message promoted acceptance for managing sea otters (utilitarian-consumption), and for exerting control over sea otters (dominionistic). This shift in attitudes occurred even though the negative message was perceived as less convincing and believable than the positive or neutral messages. In Study 2 we evaluated people's implicit and explicit preferences for four species at risk in B.C. (sea otter, American badger, caribou, and yellow-breasted chat). We found that explicit rather than implicit

preferences predict intended donations to conserve each species. Findings suggest that people apply the affect heuristic when judging species—species that are less liked may be perceived as riskier, and vice versa—. This finding holds for both residents in B.C. (n=55) and outside of B.C. (n=463). The results from the two studies highlight the importance of studying public perceptions of species. We demonstrate that despite it being underutilizes, the application of psychological research is useful for informing conservation campaigns and communication.

EXPLORING BIODIVERSITY CONSERVATION THROUGH COMMUNITY–BASED ECOTOURISM DEVELOPMENT IN SURAMA, GUYANA

Paulette Bynoe, University of Guyana

Biodiversity is critical to human development given its provision of food, medicine, building materials, as well as its services to environmental regulation, soil conservation, and pollution control. Ecotourism should "conserve the environment and sustain the well-being of local people" (TIES, 1991). Community based ecotourism has long been recognised as a popular tool for achieving ecological, social and economic goals in rural communities. Such a view is based on ecotourism's potential to generate economic benefits to local households, as well as foster a sense of local ownership, improved attitudes and consequently, guardianship of environmental resources, and more importantly, conservation of biological resources. This interdisciplinary study aims to investigate the degree of mutual dependence of ecotourism and biodiversity in the context of a rural indigenous community: Surama in Guyana. The study therefore employs a mixed methods approach involving a desk review of available literature on the subject, rapid biodiversity assessment along transects and a cross-sectional study, using a piloted questionnaire to: (i) determine the floral and faunal biodiversity in the community; (ii) discuss the ecological, social, and economic incentives (associated with ecotourism) that provide direct and indirect benefits (in terms of ecosystem's goods and services) to local households; (iii) determine the temporal and spatial extent of such benefits and the impact on long term biodiversity conservation; (iv) highlight institutional issues (linkages, competitiveness, planning and management strategies, among others) that enable or threaten the support of ecotourism to biodiversity conservation in the local community; and (v) discuss opportunities and measures that could enhance ecotourism potential and biodiversity conservation at the community level.

EXPLORING HILLSLOPE SEEP WETLAND IMPORTANCE IN RELATION TO LIVESTOCK GRAZING-USING A SOCIAL ECOLOGICAL SYSTEMS APPROACH IN THE UPPER TSITSA CATCHMENT, SOUTH AFRICA

Notiswa Libala, Rhodes University, South Africa

In South Africa, ecosystem services, particularly in rural areas, are increasingly being subjected to enormous pressure as the demand for social and economic development come into tension with environmental sustainability. Human activities continue to alter the environment on local and global scales, and these alterations are leading to changes in ecosystem structure and function, as well as the composition of biotic communities. In the upper Tsitsa River catchment, seep wetlands are among the critical wetland ecosystems that supply biomass for grazing throughout the year. In the absence of appropriate management strategies within communities and a lack of scientific understanding of the functionality of these ecosystems in terms of their biodiversity-ecosystem functioning, they are disappearing at an increasing rate within the catchment. This study sought to engage with key stakeholders within the community to elicit information regarding their understanding of seep ecosystems. Three communities that are surrounded by seep wetlands were selected in this study. In each community, a total 15 households were interviewed for baseline information including human demography, livestock types, importance of seep wetland as ecosystem for livestock grazing, condition of seep wetlands, possible solutions for seep protection as well as the willingness of local people to join Catchment Management Forums. The majority of the respondents from preliminary results observed the condition of seep wetlands as highly to moderate eroded. They indicated grazing exclusion during dry 'period as an effective measure for improving seep vegetation. Fencing was also suggested as an important way for conserving highly eroded seep wetlands. Key words: Ecosystem services, local knowledge, Ecosystem functioning, livestock grazing

EXPLORING THE GUT MICROBIOME IN NEOTROPICAL JAGUARS AND PUMAS: THE NEXT BIG THING IS REALLY SMALL

Claudia Wultsch, Panthera & AMNH; George Amato, American Museum of Natural History; Marcella Kelly, Dept of Fisheries and Wildlife; Konstantinos Krampis, City University of New York; Howard Quigley, Panthera; Lisette Waits, Univ of Idaho

With growing human populations expanding into wild animal habitats, research on wildlife gut microbiomes, comprised of thousands of commensal, symbiotic, and pathogenic microorganisms, and functionally associated

with host health, nutrition, and indirectly with the quality of their habitat, is of increasing interest in wildlife conservation. Presently, however, microbiome studies solely based on field-collected fecal samples are rare and require preliminary tests to understand how various extrinsic and intrinsic factors affect microbial communities after defecation. Here, we examine the gut microbiome of free-ranging jaguars (*Panthera onca*) and pumas (*Puma concolor*), using fecal samples non-invasively collected at two protected areas in Belize, Central America. We apply high-throughput 16S rRNA metagenomic sequencing using an Illumina MiSeq platform to characterize diversity, richness, and composition of gut microbiomes in these two large felid species studied across distinct forest types (tropical broadleaf and tropical pine forest), with varying levels of anthropogenic disturbance. We conclude that gut microbiomes in free-ranging jaguars and pumas are highly diverse and complex, with microbial communities having higher diversity levels in pumas compared to jaguars (Adonis test, R2 = 0.22, P = 0.001). Hierarchical clustering analysis revealed that microbiome profiles generated for individual felids grouped based on their geographic location. This project provides important baseline data on gut microbiomes in two large Neotropical felids, that will support ongoing conservation efforts managing these threatened wildlife species in Belize and beyond. Furthermore, we discuss applications and challenges of this research approach and give recommendations for future metagenomics studies focusing on the conservation of free-ranging wildlife species.

EXTENT AND CONSERVATION STATUS OF GLOBAL HOTSPOTS OF RARITY AND RICHNESS

Fábio De Albuquerque, Arizona State University

Since the last two decades, a great number of prioritization studies, based on species richness, have used global range maps of vertebrate species to identify critical areas for conservation. However, species richness not always is a good surrogate of species diversity. This study used rarity-weighted richness (RWR) index to provide global HRR maps of maps for amphibians, birds, and mammals, to identify the environmental variables associated with the distribution of HRR for these vertebrates, and to investigate the anthropogenic transformation caused by human interaction within each HRR. Distribution maps for 21,697 vertebrates were used to describe the biogeographical distribution of RWR values for vertebrates. 41 potential predictor variables associated with species richness patterns at the global extent and a varimax-rotated factor analysis (VrFA) were used to identify sets of relatively uncorrelated environmental variables. Random forests models (Breiman 2001) were used to investigate the relationships between VrFA factors and RWR. Results showed that RWR were concentrated in the Neotropical, Afrotropical and IndoMalay biogeographical for each of the 3 taxa. The spatial distribution of HRR was strongly related with environmental variables, especially energy-related variables. Populated woodlands, representing forest regions with minor land use and significant populations, were the most extensive of the populated biomes, covering nearly 15% of HRR area for all taxa. Rapid progress in the conservation fields, both pure and applied, were possible thanks to theoretical and conceptual advances. Results indicate that the ability to identify hotspots from areas with high concentrations of limited-range species, as well as areas with high species composition, may improve the way in which sites are prioritized for conservation, so that all or most species can be conserved in affordable areas.

EXTENT OF THE IMPACT OF THE CHINESE WILDLIFE TRADE ON THE WORLDS WILDLIFE

Olivier Boissier, Unemployed; Simon Ducatez, University of Sydney, School of Biological Sciences, NSW 20906, Australia

Overharvesting is one of the key drivers of biodiversity loss. With rising human population and standards of living in many emergent and developing countries, demand for wildlife is on the increase. As it endangers such charismatic and evolutionarily distinct species as elephants, rhinoceroses or pangolins, the particular case of China has been in the spotlight in recent years. The number of species impacted by the Chinese wildlife trade seems to be very high, and numerous taxonomic groups to be affected. Species targeted originate from many places worldwide beyond the mere borders of China or its neighboring countries. We therefore aimed to quantify the exact extent of the impact of the Chinese wildlife trade on species endangerment worldwide. We focused on Amniotes ('Reptiles', Birds and Mammals) and used the IUCN Red List of Threatened Species (version 2016-3) to review which Amniote species threatened by biological resource use were affected by the Chinese wildlife trade. CITES databases and IUCN/SSC specialist groups provided further information. Preliminary results for turtles and tortoises (Testudines) show that out of 232 extant species and 181 threatened species, a minimum of 55 (24% of extant species, 30% of threatened species) are impacted by the Chinese trade. We found 62% of all species in East, South and South-East Asia to be threatened by this trade. Extensive results will be presented over all 21760 extant Amniote species and will provide a comprehensive assessment of the impact of the Chinese wildlife trade on their conservation status. We will highlight which

taxonomic groups and regions of the world are most impacted by this trade, and will analyze species use and influence of CITES listing and range country protection. We aim to emphasize how better regulations and law enforcement at a single country scale could significantly reduce threats over a wide range of taxa worldwide.

EXTINCTION RISK ASSESSMENT OF MARINE FISHES OF COLOMBIA 2017

Andrea Polanco, Invemar; Arturo Acero, Universidad Nacional de Colombia; Juan Caldas, CI; Luis Chasqui, Invemar; Paola Mejía, Fundación Squalus; Andrés Navia, Fundación Squalus; Luis Zapata, WWF

The extinction risk assessment of Colombian marine fishes was developed in two stages; first, an expert team coordinated by Squalus Foundation carried out the assessment of sharks, rays, and chimaeras; subsequently, Invemar started the same process with bony fishes. The results of both processes are compiled in the Red Book of Marine Fishes. More than 40 researchers and 17 national institutions were involved in the processes. The evaluation followed IUCN Red List Categories and Criteria version 3.1, considering the guidelines for using the criteria at the regional level. One hundred and twenty-three species were evaluated, 37 previously assessed and 86 species included in this process (54 bony fishes and 32 cartilaginous fishes). Most evaluations considered the criterion A (reduction of population size) related to species affected by overfishing, others were under criterion B for species with restricted distribution, and a few more were evaluated under criterion D for being endemic or very restricted species with small populations. The results shown 56 threatened species: 6 CR, 7 EN and 43 VU. In reassessed species five were uplisted, three downlisted, and three were changed to DD, which are considered as not genuine changes. Overfishing and the use of non-regulatory arts are the main threats identified in Colombia, mainly in species with restricted or patched distributions which depend on coastal habitats to complete their life cycle. Restricted distribution or even endemism is also a relevant threat considered, due to possible effects of ENSO events. The discontinuity and poor geographical coverage of fishing data available added to the lack of specific fishing statistical information and indicators of population health restrain inferences about fishing impact on several populations. These results highlight the urgent need to advance in the study and monitoring of marine fish stocks in Colombia.

FARM MANAGEMENT AND BIODIVERSITY: CONSERVING REPTILES AND FROGS IN GRAZING LANDSCAPES

Stephanie Pulsford, Australian National University

Food security is a major social and economic challenge that is threatening ecosystems throughout the world. We need to find new ways of maintaining food production while reducing biodiversity loss as the global demand for food increases pressure on agricultural systems. One solution is to improve how agricultural land is managed by farmers to improve habitat and resources for native species. In this presentation, I present findings from an Australian study on the influence of management strategies on native reptiles and frogs in grazing landscapes. We performed pitfall and funnel trapping on twelve grazing in SE Australia. Grazers managed large amounts of land in this region and therefore their management actions can have a large influence on biodiversity conservation. Reptiles were strongly influenced by vegetation cover at various scales, with more reptiles associated with remnant woodland, tree cover, leaf litter and the total amount of woody vegetation within the surrounding area. Rare reptiles were positively influenced by common management features of linear plantings and fence lines. Frogs however, responded most strongly to climatic variables and the distance to the nearest water body. Conservation for reptiles and frogs in agricultural landscapes requires some differences in focus but both groups will benefit from maintaining remnants of native vegetation within farmland, regardless of size. For reptiles, key vegetation characteristics such as trees, leaf litter and shrubs must be promoted, and linear planting and fence lines may provide additional resources and habitat. For frogs, key management features involve maintaining water bodies and providing a range of vegetation types within the landscape. These findings provided clear recommendations on how to improve management in grazing landscapes to achieve the twin goals of food security and biodiversity conservation.

FINDING POLITICALLY FEASIBLE CONSERVATION STRATEGIES: THE CASE OF WILDLIFE TRAFFICKING

Timothy Haas, Lubar School of Business, Univ. of Wisconsin-Milwaukee, United States

Conservation managers work within a political-ecological system when they develop and attempt to implement a conservation plan that is designed to meet particular conservation goals. We develop a decision support tool that can identify a conservation strategy for a managed wildlife population that is both sustainable and politically feasible. We build, fit, and use our tool on the case

of rhino horn trafficking between South Africa and Asia. As part of our tool, we build a simulation model composed of interacting influence diagrams (Bayesian belief networks with decision nodes) that model the decision-making process of each group (agent). These groups include poachers, trafficking middlemen, Asian rhino horn consumers, and anti-poaching units. Rhino population dynamics is captured with an individual-based model derived from ecological theory that explicitly tracks through time every rhino in South Africa (about 10,000 animals). This interacting political-ecological model is statistically fitted using minimum simulated Hellinger distance to observations on group actions and data on rhino abundance. This fitted model is then used to compute a politically feasible conservation strategy by finding parameter values that characterize group belief systems that are minimally different than the statistically estimated values but for which the decisions made by these groups are altered just enough to cause the wildlife population to be sustainable.

FINDING THE NEEDLES IN THE EVIDENCE HAYSTACK: SMART SORTING FOR CONSERVATION DECISION-MAKING

Caitlin Augustin, DataKind, Abess Center for Ecosystem Science and Policy,University of Miami; Sam Anzaroot, DataKind; Samantha Cheng, National Center for Ecological Analysis & Synthesis; Burton DeWilde, DataKind, ChartBeat; Madeleine McKinnon, Vulcan, Inc.; Robert Minnich, DataKind, Columbia University; David Wilkie, Wildlife Conservation Society

The exponential growth of scientific output -- doubling every nine years -- means that researchers, practitioners, and decision-makers must dig through a near-overwhelming amount of evidence to determine what works and what does not to make informed decisions in conservation. While methods to systematically identify and synthesize evidence from the literature in an unbiased fashion -- namely, systematic maps and reviews -- have tremendous potential to facilitate evidence-based decision making, these require manual searches that are both labor-intensive and prone to human error. This tremendous labor input has been a disincentive to producing high quality and up-to-date reviews that would be invaluable to the conservation community. Technical advances in human-assisted machine learning and data visualization have the potential to substantially reduce the "activation energy" required to find the proverbial "needles" in a haystack of tens of thousands of documents and efficiently and accurately extract relevant information to synthesize the state of knowledge on key conservation impacts. Working with Data Corps volunteers from the organization DataKind, a Science for Nature and People Partnership team has developed two free and open-access web-based processes for computer-assisted paper review and evidence management. Housed in a single web application (colandrapp.com), these collaborative research tools aim to use open source materials and big-data techniques to assist researchers in completing an accurate and timely evidence review. Reviews completed using this application are easily visualized, portable, and shareable to enable speedy information uptake by practitioners and decision-makers. We will describe and demonstrate the computer-assisted review system, illustrate improvements over current approaches to evidence searching, extracting and sharing and outline where other technological improvements are possible.

FIRE CULTURE AND THE STATE: NATURAL RESOURCE GOVERNANCE FOR EFFECTIVE BIODIVERSITY CONSERVATION

Dana Baker, Duke University

The Guinean Forests of West Africa, one of the most fragmented regions on the planet, is considered a biodiversity hotspot of global significance. Changing climates, widespread poverty and pressing development needs make the design of effective natural resource management systems urgent and increasingly complex. Across the Akwapim-Togo Mountain Range of Ghana, part of the larger Guinean forest system, state policies to deter destructive land management practices are ineffective. Practices such as slash and burn agriculture remain culturally entrenched despite clear state policies against the use of fire on the landscape. Uncontrolled fires frequently burn homesteads, upland forests, riparian corridors, and conservation areas resulting in massive economic loss. A clear disconnect exists between stated policies, implementation and enforcement, as well as between customary and state-led systems of natural resource governance. This research presents findings from a project that used a multi-method approach and was conducted as a Graduate Student Research Fellow at the Institute of Environment and Sanitation Studies, University of Ghana. Findings suggest that individual farmers are acutely aware of their changing environment. Yet, they lack access to the technical and financial resources necessary to adapt to shifting climates, degrading ecosystems and fluid state policies. The use of fire as a land management technique is paramount to farmers as the most efficient and effective way to clear land. However, uncontrolled fire is also a top concern among communities. Results suggest ways to improve conservation and natural resource management by better connecting Ghana's state-led systems with informal

systems of land and resource management. Bridging this gap will increase capacity to adapt to climate change, will enable the state to effectively govern the country's natural resources, and will provide the foundation for the conservation of the region's biodiversity.

FIRE EFFECTS ON COMPOSITION DIVERSITY AND PHYLOGENETIC STRUCTURE OF SEMI-ARID BIRD COMMUNITIES

Zoe Reynolds, Australian National University

Fire is a major disturbance process in many ecosystems and plays an important role in driving patterns of diversity. Fire regimes (frequency, intensity, and interval) are predicted to change due to changing climate and other anthropogenic influences. Inappropriate fire regimes are already considered a threatening process for many species around the world, including more than 50 Australian bird species. In order to predict and mitigate the impacts of changing fire regimes, we need to better understand species' responses to fire and the importance of fire in driving spatial and temporal patterns of species abundance and diversity. We investigated variation in semi-arid woodland bird communities in South Australia using 17 years of monitoring data from 29 locations with varying fire histories. We compared the effects of fire history, climate, and habitat on species richness, phylogenetic diversity, and community composition. We found a temporal decline in species richness and phylogenetic diversity across the study region which was initially driven by rainfall but exacerbated by the occurrence of fire. Responses to fire varied between bird species and foraging guilds, driving spatial and temporal variation in community composition. Our results show that changes in fire regimes are likely to have a severe impact on bird communities, particularly in areas where rainfall is highly variable. The impacts of fire will vary between bird species, and management regimes will need adjusting to conserve fire vulnerable species and maintain bird communities.

FIRST POPULATION DENSITY ESTIMATION AND GUIDELINES FOR COMMUNITY MONITORING OF P. CAQUETENSIS

Johana Villota, Centro Internacional de Agricultura Tropical, CIAT; Javier García, Fundación Herencia Natural; Javier Enrique García Villalba, Fundación Herencia Natural

Plecturocebus caquetensis is a recently discovered primate species classified as Critically Endangered (CR) according to the International Union for Conservation of Nature (UICN). It has been considered that its population has been diminished to 80% in 24 years, which is directly related to the continuous reduction of the occupation area caused by extensive livestock farming and illicit crops as the main agriculture activities in the region (García et al. 2010). The former activity is the worst because rates of deforestation in Caquetá constitutes 46% of the whole Colombian-Amazon deforestation (IDEAM, 2014). The species was surveyed through a 4.373 km trail system walked regularly over 6-month period, accumulating a total sampling effort of 84.39 km and 54 sightings. Data were analyzed using DISTANCE 10.2, using the perpendicular distance from primate to transect. In an area of 151.78 hectares, 13.456 groups/km2 (%CV= 17.78, CI= 9.064-19.975) were found, which range from 1 to 6 individuals, with a mean cluster size of 3. To define the second goal, guidelines for construction of a community monitoring programme were defined through non-structure interviews, secondary sources and local researcher's considerations. The main problematics found to establish management strategies are the misinformation of local people within researcher's intentions, gaps of scientific knowledge in the ecology, ethology and phenology of fauna and flora species and habitat loss, which require urgent and short-time solutions to proceed and succeed with conservation initiatives. This study aims to start fulfilling gaps of ecology and population dynamics knowledge, and intents to call local institutions, ONGs, universities and researchers attention on participating and supporting new projects intended to elucidate the impact of habitat loss on species population through long-term studies.

FLAWED EVIDENCE ON THE METHABOLIC THEORY OF ECOLOGY IS UNDERMINING MANAGEMENT OF LIONFISH INVASION

Diego Valderrama, University of los Andes

Given its ability to yield predictions for very diverse phenomena based only on two parameters – body size and temperature –, the Metabolic Theory of Ecology (MTE) has earned a prominent place among ecology's efficient theories. In a seminal article, the leading proponents of MTE claimed that the theory was supported by evidence from a Pauly (1980) dataset on natural mortality, biomass, and environmental temperature for 175 fish stocks spanning tropical, temperate and polar locations. We demonstrate that the evidence presented by MTE's proponents is flawed because it fails to account for the fact that Pauly re-estimated environmental temperatures for polar fish as ´physiologically effective temperatures´ to correct for their "abnormally" high natural (mass-corrected) mortalities, which on average turned out to be similar to (rather than lower than) the mortalities recorded for temperate fish. Failing to account for these modifications skews the coefficients from MTE regression models and wrongly validates predictions from the theory.

It is important to point out these deficiencies given MTE's broad appeal as a theoretical framework for applied ecological research. In a recent application, MTE was used to estimate biomass production rates of prey fish in a model of invasive Indo-Pacific lionfish predation in Bahamian reefs. It is shown that the MTE coefficients may lead to a drastic overestimation of prey fish mortality and productivity rates, leading to erroneous estimations of target densities for ecological control of lionfish stocks. A set of robust mortality-weight coefficients is proposed as an alternative to MTE.

FOREST BIRD CONSERVATION IN AFRICAN AGROFORESTRY MATRICES HOW MUCH FOREST IS NECESSARY

Denis Kupsch, Conservation Biology, Georg-August-Universität Göttingen; Kadiri Bobo, Department of Forestry, University of Dschang; Francis Njie, Mount Cameroon National Park, Buea, Cameroon; Elleni Vendras, Conservation Biology, Georg-August-Universit?t G?ttingen, REC; Elleni Vendras, Conservation Biology, Georg-August-Universitaet Gottingen; Matthias Waltert, Conservation Biology, Georg-August-Universitaet Gottingen

In the debate on how much forest is necessary to maintain substantial presentations of forest bird fauna in human-modified landscapes, it is important to understand the nature of the relationships between forest cover and bird diversity. While some studies have modelled a linear decrease of forest biodiversity with deforestation, others have detected occurrence thresholds. Most previous research on this topic had been undertaken in fragmented landscapes or did not provide differentiated analyses of full species assemblages. We sampled birds (432 sampling points, 198 species, 6,883 bird encounters) in 48 one-km² sample sites along a gradient of deforestation (0 to 100 %) across a 4,000 km² section within the forest-dominated landscapes of Southwest Cameroon. We applied multiple additive regression splines to model ΨΨ and Ψspecies richness of different bird guilds in relation to forest cover. Overall Ψand Ψspecies richness remained constant between 100 % and 42 % forest cover. However, total Ψichness as well as all richness partitions of Guinea-Congo biome-restricted, large-bodied arboreal foliage gleaning, tree nesting and frugivorous species already declined below a forest cover of 74 %. Ant-followers and terrestrial insectivores showed highest richness only at zero deforestation. Below 42 % forest cover, there were strong increases in open-land, granivorous, miscellaneous insectivorous and widespread species, while richness of biome endemics and forest specialists dropped by more than one third. High Ψdiversity values at medium deforestation indicate that the sharp decline of original forest bird diversity may only be compensated by habitat and foraging generalists that benefit from higher habitat heterogeneity. Our study implies that Afrotropical forest bird diversity decreases in a non-linear way with deforestation and that critical thresholds of forest cover at local scales may be much higher (more than 70 %) than previously reported.

FOREST CONNECTIVITY FOR SEED DISPERSAL IN BORNEO: BEFORE AND AFTER OIL PALM DEVELOPMENT

Natalia Ocampo-Peñuela, ETH Zurich; John Garcia Ulloa, ETH Zurich; David Gaveau, CIFOR; Jaboury Ghazoul, ETH Zurich

Animal-assisted seed dispersal is an important ecosystem process often imperiled by habitat loss and fragmentation through the reduction of functional landscape connectivity. The loss of seed dispersal affects natural regeneration processes (e.g., through changes in gene flow or vegetation dynamics) in remnant forests, and can limit the outcomes of forest restoration initiatives. In Borneo, rapid oil palm expansion has resulted in extensive forest loss and fragmentation, likely impacting functional connectivity and seed-dispersal processes across forested landscapes in the island. To investigate these impacts, we modeled changes in habitat availability, species distribution and functional connectivity of frugivorous forest vertebrates between 1973 and 2015. We mapped concentrations of frugivorous vertebrate species using refined species distributions and habitat availability maps, and modeled landscape functional connectivity for these species through graph theory approaches. Our methodology identifies the contribution of a forest patch to the overall functional connectivity of the landscape. Spatially explicit models of connectivity for frugivorous birds and mammals showed a marked loss of connectivity throughout Borneo's forests over the past 40 years, in particular for forests below 1000 m. These lowland forests are highly diverse and can house concentrations of up to 60 frugivorous species in a given patch. The extirpation of these species is likely harming native plant populations, with impacts that are expected to worsen over generations. Through our models we are able to identify areas that are critical to the conservation of functional connectivity for frugivorous species at the landscape and regional scales. As such, our approach can be used to prioritize areas for the maintenance of seed dispersal processes. These conservation priorities are especially important in the face of continued expansion of commodity plantations (such as oil palm) in Borneo.

FOREST DEGRADATION AND ATTITUDES OF FOREST DEPENDENT PEOPLES TOWARDS LOCAL REFORESTATION

Lauren Nerfa, University of British Columbia; Jeanine Rhemtulla, University of British Columbia

Deforestation and forest degradation threaten ecosystem functioning and services, particularly in the tropics where dependence on forests for myriad services is high. International commitments to reforestation such as the Bonn Challenge aim to counter forest loss, yet the extent of degradation in areas of high dependence and local attitudes on reforestation are poorly understood. Successful forest restoration must consider local needs as well as ecological characteristics. Our research asks: 1) how forests with high local use differ ecologically from relatively undisturbed forests and 2) whether households' relative forest dependence is correlated with their attitudes on reforestation. We conducted the study in Malawi, Africa, which has extreme levels of poverty, high reliance on fuelwood for energy, and widespread forest degradation. To assess the effects of forest use, we compared species diversity, composition, and biomass in forest plots where villagers collect fuelwood (N=52) and in reference sites (N=36) in Miombo woodlands with minimal use. To determine the extent of household dependence on forests for their livelihoods and to investigate views on reforestation, we conducted household surveys (N=157) to collect data on demographics, income, assets, forest use and reforestation attitudes. Results showed that forests where households collect fuelwood had significantly lower species richness, abundance, diversity and biomass than reference sites. Ordination analysis suggested that forest sites with fuelwood collection had distinct and more varied tree species composition than intact Miombo woodlands. The reduction in species diversity and biomass warrants restoration of highly used forests. Attitudes on reforestation with respect to socio-economic standing and relative forest dependence will be discussed to show how tree planting efforts that supply fuelwood for communities can be coupled with forest conservation to achieve local ecological and social goals.

FORMULATION OF A STRATEGIC NATURE TOURISM PLAN IN THE COLOMBIAN MOORS AS A TOOL FOR CONSERVATION

David Lesmes, Fundación Reserva Natural La Palmita Centro de Investigación

Between 2013 and 2017, The foundation has been helping building a sustainable development of the Andean and orinoquia region, through different projects focused on strengthening conservation and sustainable uses of the territory. With the work done in the strategic ecosystems. Currently, it is linked to the Páramos project, whose mission is the conservation, restoration and sustainable use of ecosystem services between the moors of Sumapaz, Chingaza, Guerrero and the Eastern Hills of Bogotá and its area of influence, an initiative of the Mayor's Office of Bogota led by the Aqueduct Company of Bogotá, where two lines of work have been developed. The first one is due to the formulation of a Strategic Nature Tourism Plan for the municipalities in the area of influence of the páramos project that contributes to strengthening community tourism in The region, engaging local actors and institutions, seeking sectoral integration, linkages and innovation, increasing cooperation and partnership between sectors and territories and regional and national policies, and the second seeks to strengthen seven local rural organizations present in strategic ecosystems That as project seeks to promote the sustainable use of the territory using the tourism of nature with a community approach where it is possible to strengthen productive chains with local population through the principal touristic services, reinforcing processes of identity And territorial appropriation, guaranteeing the conservation of strategic high mountain ecosystems of the area of influence of the páramos project, which strengthen and support the productive reconversion of the territory.

FOSTERING ORPHANED AMERICAN BLACK BEARS TO WILD-CAUGHT CAPTIVE FEMALES

Bernardo Mesa-Cruz, Virginia Tech; Marcella Kelly, Dept of Fisheries and Wildlife; Colleen Olfenbuttel, NC Wildlife Resources Commission; Michael Vaughan, Virginia Tech

Management actions regarding American black bear cubs (*Ursus americanus*) orphaned from wild females can be controversial in the United States. Fostering dependent orphaned cubs to adult females with cubs of similar weight is a management alternative to cub euthanasia, rehabilitation, or permanent captivity. We assessed cub fostering efficacy at Virginia Tech's Back Bear Research Center (VT-BBRC) and determined fostering impacts on biological cubs. Sixty-five orphaned cubs (40M; 25F) were fostered to 31 different females that had their own litters. Females were captured in the wild in July-October, and released back into the wild with cubs the following April-May, in the State of Virginia, USA. Over 70% of fostering events at the VT-BBRC occurred in March and April. Average orphan cub weight at time of fostering was 1,986 g, which was not different from the average weight of biological cubs born to surrogate females. Additionally, upon release in early May, average foster cub weight (2770 g) was not different from the average weight of the biological litter mate. The number

of biological cubs in a litter did not affect weight gain of orphaned cubs. Similarly, final litter size after fostering events did not influence biological cub daily weight gain. Mean survival from time of fostering until release was over 90%. Fostering orphaned cubs to denning captive females with cubs resulted in high cub survival and did not appear to affect biological cub weight gain. Thus, cub fostering may be an effective management alternative for wildlife agencies in the United States.

FRAGMENTATION EFFECTS ON THE RELATIONSHIP BETWEEN SPECIES DIVERSITY AND FUNCTIONAL DIVERSITY

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A crucial task in conservation biology is predicting how land use change affects the response trajectories of species diversity and functional diversity (the variation or dispersion of functional traits in an assemblage). Although the importance of managing fragmentation has been highlighted for protecting biological assemblages, the development of predictive models that explore the relationship between functional diversity and species diversity in spatially explicit ways is currently limited. Furthermore, the underlying mechanisms that account for patterns of trait diversity after land use change and fragmentation remain largely unknown. Here, we present a model that shows how the interaction between functional traits, habitat loss and fragmentation influences species diversity and its potential to maintain ecosystem functions. By evaluating the distribution of functional traits, we show that is possible to predict how the number of species affect patterns of functional diversity among different communities. Although fragmentation may have small effects on species diversity, it affects the relationship between the number of species and the distribution of functional traits. With small amounts of habitat and random fragmentation patterns, communities where most of the species have low dispersal capacities tend to maintain high levels of functional diversity. However, clustered patterns of fragmentation tend to decrease functional diversity abruptly at medium and high levels of habitat loss. As we are usually highly constrained by how much habitat we can protect, our results suggest that controlling the spatial arrangement of landscape elements (e.g., through control of fragmentation) is important to enhance the conservation of different aspects of biodiversity.

FRAGMENTATION REVISITED CHANGING INTERACTIONS WITH BARRIERS IN A BIGHORN SHEEP METAPOPULATION

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Studies estimating movement, dispersal, or gene flow in anthropogenically-fragmented habitats are usually based on a single study period, but those processes may vary depending on population density, behavioral changes, or other factors. We contrasted genetic structure and gene flow across barriers for a metapopulation of desert bighorn sheep (*Ovis canadensis nelsoni*) using genotypes collected in 2000-2003 and in 2013-2015, a span of only two bighorn sheep generations. Based on the recently-observed spread of a respiratory pathogen across the study area, we hypothesized that bighorn sheep changed how they interacted with anthropogenic barriers over that time period, and that shifts in metapopulation structure influenced gene flow, genetic diversity, and connectivity. Population assignment tests, genetic structure, and genetic recapture of individuals demonstrated that bighorn sheep crossed the interstate highway in at least one location in 2013-2015, but supported conclusions of an earlier study that such crossings were very infrequent or unknown prior to 2000-2003. By 2013-2015, a newly-expanded population established strong new links among three other populations, and we detected other dramatic changes in genetic structure after only two bighorn sheep generations. Genetic diversity increased only moderately in populations linked by new connections. We propose that changes in movement patterns and structure were driven by increasing population sizes and expanded habitat use. Animal movement models should be revisited periodically to enable informed management, particularly in dynamic and anthropogenically-influenced systems.

FRAMEWORK TO ASSESS ECOLOGICAL AND ANTHROPOGENIC DRIVERS OF CARNIVORE DECLINE IN MODIFIED LANDSCAPES

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Anthropogenic landscape modifications are key threats to the long-term persistence of terrestrial mammals, particularly carnivores which are also susceptible to direct persecution by people. Managing "human-predator

relations" (HPR) entails the challenge of identifying social and ecological impacts, particularly at the time-space intersection between carnivore and human activity. We suggest an integrated framework based on dynamic occupancy models to examine how landscape habitat configuration and HPR may interact and affect carnivores. For additional evidence of HPR we suggest the use of random response techniques to estimate the prevalence of illegal killing for the entire landscape. We apply the proposed approach to showcase how threats to carnivores may be assessed across a human-dominated landscape in south-central Chile, using the guiña (*Leopardus guigna*), an IUCN Red Listed felid and forest specialist, as a model species. We use data derived from multi-season (n=4) camera-trap surveys (>23,000 camera trap nights), remote-sensed images and face-to-face questionnaires (n=233) with residents living in the one or two households closest to the camera-traps within each sample unit (n=145). Our study species and system shows that the guiña can tolerate a high degree of habitat loss (<10%), but models suggest that the long term presence (<0.2 extinction probability) is better explained by the number of habitat forest patches (>80) and the level of land property subdivision (<41) rather than by non-sensitive HPR such as predation events, tolerance and encounters reported by respondents. Estimates of illegal killing seem low but similar to the level of reported predation and farmers who have encountered guiña more frequently are increasingly likely to kill one. We argue that this framework which combines HPR and ecological data in space and time, can allow for a more robust evidence-base for informing conservation efforts and research.

FROM INDIVIDUAL BEHAVIOR TO COLONIZATION OF NEW HABITATS BUTTERFLIES IN FOREST LANDSCAPES

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Ecological processes that assemble local communities from available species pools are a key for the conservation of biological diversity. With habitats becoming more isolated, dispersal is playing an increasingly essential role for maintaining viable populations and assembling local communities. However, evaluating dispersal limitation in animal populations at ecologically relevant spatiotemporal scales is difficult, posing challenges for bridging individual dispersal with the build-up of local assemblages. In this study, we examined to what degree individual-level dispersal patterns translate into the colonization of new habitats in butterflies. For this purpose, we took advantage of conventional, clear-cutting-based forest management practices which create variously isolated open spaces in temperate and boreal forests in Northern Europe. We have shown that, at the time of drastic decrease of grasslands, these temporal forest openings provide potentially suitable habitat for many grassland butterfly species. On the other hand, open habitat butterflies are also known to perceive forest as a dispersal barrier, for why the use of clear-cuts by butterflies as habitats may be limited. We compared butterfly diversity in isolated clear-cuts (i.e., completely surrounded by forest) with their diversity in clear-cuts connected to the network of other forest openings (e.g., by wide road verges or power line corridors). We found no consistent differences in butterfly species richness and composition between isolated and non-isolated clear-cuts. Neither was colonization of clear-cuts affected by species traits. Colonization of new habitats thus cannot be derived directly from behavioral patterns of butterfly dispersal. Our results suggest that managed forests may substantially contribute to maintaining viable butterfly populations.

FUNCTIONAL LANDSCAPE CONNECTIVITY AND MOVEMENT CORRIDORS MODELLING FOR AFRICAN ELEPHANT

Liudmila Osipova, Bangor University, University of Goettingen; Matt Hayward, Bangor University; Niko Balkenhol, University of Goettingen

In this study, we explored how species-specific functional landscape connectivity models alter according to the seasonal changes and how this knowledge may benefit the landscape conservation planning. We used telemetry and remote sensing data analysis for being able to define seasonality, design seasonal connectivity models and assess their performance relative to the general model. To predict functional connectivity, it is a common practice to model landscape resistance surfaces, which represent spatially-explicit probabilities of species movement considering environmental conditions, behavioral states and mortality risk. We applied step-selection functions to build functional connectivity models for African elephant (*Loxodonta africana*) in a seasonal environment to illustrate how seasonal connectivity differences affect predictions of movement corridors. Based on each model, we predicted movement corridors connecting major protected areas using least-cost path and circuit theory analysis. We showed that individual differences lead to substantial changes in landscape connectivity models and predicted movement corridors. Specifically, the number of corridors, their locations, lengths and strengths are highly dependent on the season. We revealed connectivity patterns that are stable and variable across seasons and summarized how this knowledge may contribute to the conservation planning. Our analysis demonstrates the importance of

accounting for inter-individual variability in movement behavior and seasonality when modelling landscape resistance and functional connectivity. Since the routes of predicted movement corridors for African elephants among protected areas change with seasons, seasonality should be considered in spatial conservation prioritization.

FUTURE FIRE SCENARIOS HOW FIRE MANAGEMENT STRATEGIES SHAPE HABITAT FOR THREATENED SPECIES

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Globally, fire is used as a management tool to reduce fuel-loads, and thus the risk of large wildfires. To achieve this, land management authorities commonly implement area-based targets for prescribed burning. This approach has the potential to greatly affect biodiversity by changing the availability of post-fire successional stages. To assess the impact of fire management practices on biota, it is critical to understand the temporal and spatial scales at which fire affects species in an ecosystem. Such information is challenging to obtain in systems with historically long fire-return intervals (e.g., >100 years), especially for threatened species where data on their distributions are sparse. Across a 100,000 km2 region in south-eastern Australia, we collated a comprehensive dataset of occurrence for 12 threatened bird species and used recent developments in fire history mapping to test the effects of the past century of fires on their distributions. We then evaluated the effect of four scenarios of area-based fire management strategies (no prescribed burning, 1.5% of vegetated land area burned per annum, 3% p.a. and 5% p.a.) on the extent and distribution of habitat for these taxa over a 30-year period into the future. Distributions of all species were affected by the post-fire age of vegetation. Eleven species occurred most commonly in mid (20-40 years post-fire) or older aged (40-70 years post-fire) vegetation. The cumulative effect of burning at 3% and 5% p.a. resulted in periods of time with a profoundly reduced availability of these vegetation age classes, jeopardising the persistence of most species. The challenge remains to understand the capacity to which species can recover from such bottlenecks in habitat availability. Our work highlights that biodiversity is likely to be best conserved by using low levels of strategic prescribed burning to protect high-quality habitat from wildfire, and allow populations to persist while wildfire-burnt areas regenerate.

FUTURE TRADE-OFFS BETWEEN BIODIVERSITY CONSERVATION AND AGRICULTURAL PRODUCTION

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Potential trade-offs between providing sufficient food for a growing human population in the future and conserving biological diversity are driven by various biophysical and socio-economic parameters at different scales. In this study, we investigate these trade-offs by using a three-step interdisciplinary approach. We examine (i) how the expected global cropland expansion and intensification might affect agricultural production and prices, (ii) where conditions are suitable for cropland expansion and intensification under changing climate conditions, and (iii) whether these increases in agricultural production would affect areas of high biodiversity value or conservation importance. Our results show that on one hand, allowing the expansion and intensification of cropland generally results in an improved food security not only in regions where crop production rises, but also in net importing countries such as India and China. On the other hand, the estimated increases in agricultural production may exert pressure in many regions that are crucial for biodiversity protection. We analyze these hotspots of potential conflict areas and discuss our approach in the context of Sustainable Development Goals (SDGs) designed to implement sustainable pathways for increasing agricultural production while conserving biodiversity and ecosystem services.

GENETIC STRUCTURE OF SPONGE POPULATIONS IN THE GREATER CARIBBEAN RESTORATION ECOLOGY IMPLICATIONS

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Sponges are important components of the Caribbean seascape, providing various ecosystem services including a keystone role in benthic-pelagic couplings. However, sponge mass mortality events have been recorded in a number of areas, including in Florida Bay, USA, where localised cyanobacterial blooms have decimated sponge populations, including the common demosponges *Ircinia campana* (vase sponge) and *Spheciospongia vesparium*

(loggerhead sponge). The loss of these massive and dominant species has led to negative cascading impacts through the Florida Bay ecosystem, thus a restoration program has been implemented to sustain recovery of sponge communities. Currently, the genetic population structure of these species throughout their ranges of geographic distribution are unknown. To effectively predict resilience of both sponge populations and of the ecosystem, it is however important to understand how these widely distributed species are spatially connected. Sponge larvae have potentially limited dispersal so natural levels of genetic diversity, as well as the possibility of inbreeding and outbreeding depression are important considerations when sourcing candidates for transplantation. In this study, we use novel microsatellite markers to investigate population genetics and connectivity in these two-important species over different spatial scales – from sites within Florida Bay and the Florida Keys to others spanning the Caribbean region. We show how such genetic information can be used to better understand sponge population dynamics throughout the Caribbean and guide sponge restoration efforts in Florida Bay.

GLOBAL CONSERVATION TARGETS FOR LAND VERTEBRATES: LIZARDS MARCH TO THE BEAT OF A DIFFERENT DRUMMER

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Conservation of species relies on our knowledge of where they reside. To-date large-scale conservation planning for all biodiversity has been predominantly based on the distributions of amphibians, birds, and mammals. These taxa have particular ecologies and physiologies, which may be rare in other animals. However, the distributions of reptiles, with a third of land vertebrate species, have been missing. Therefore, our knowledge of the underlying processes governing all vertebrate distributions, and ability to protect them remained poor. Here, we present and analyze for the first time, the global distribution of over 10,000 reptile species, representing 99% of extant terrestrial species, and completing the global distribution map for all land vertebrates. We show that the richness patterns of the other three land vertebrate classes are good spatial surrogates for species richness of all reptiles combined, as well as for snakes, but are weak spatial surrogates for diversity patterns of lizards and turtles. Overall Lizard distribution patterns as well as range-restricted lizard richness hot-spots overlap very little with those of other taxa. Consequently, existing protected areas, sites of biodiversity significance, and global conservation schemes represent birds and mammals better than reptiles. Thus, additional conservation actions, particularly for lizards and turtles, are needed to effectively protect reptiles. We constructed a global conservation prioritization scheme for all land vertebrates, and land vertebrates bar reptiles, and highlight many new locations that become important due to the inclusion of the new reptile knowledge. Notably, investing resources in some of the world's arid, grassland and savannah habitats could greatly aid reptile conservation. Overall, the unique distribution patterns of reptiles require additional conservation attention in regions previously under-prioritized, in order to secure the prolonged persistence of all land vertebrates.

GLOBAL ELEVATIONAL DIVERSITY AND DIVERSIFICATION OF BIRDS

Ignacio Quintero, Yale University; Walter Jetz, Yale University

Mountain ranges harbour an exceptionally high biodiversity that is now under threat from global change. Yet, despite decades of effort, limited data and analytical tools have prevented a robust and truly global characterization of elevational biodiversity gradients and their evolutionary origins. This has hampered a general understanding of the processes involved in the

assembly and maintenance of montane communities. Here we show that a worldwide mid-elevation peak in bird richness is driven by wide-ranging species and disappears when using a novel sampling procedure that ensures even species representation in space and facilitates evolutionary interpretation. Instead, range size corrected richness declines linearly with elevation. We find that the more depauperate assemblages at higher elevations are characterized by higher rates of diversification across all mountain regions, rejecting the idea that lower recent diversification rates are the general cause behind less diverse biota. Across all elevations, assemblages on mountains with greater seasonality exhibit more rapid diversification, highlighting the importance of climatic fluctuations in driving the evolutionary dynamics of mountain biodiversity. While different geomorphological and climatic attributes of mountain regions have been pivotal in determining the remarkable richness gradients observed today, our results underscore the role of ongoing and often very recent diversification processes in maintaining the unique and highly adapted biodiversity of higher elevations. Mountain ranges harbour a large fraction of extant biodiversity that is often very uniquely adapted and now under immense threat from climate change, our results highlight the need to safeguard both the past outcome and future of their diverse ecological and evolutionary dynamics.

GLOBAL FOREST LOSS DISPROPORTIONATELY ERODES BIODIVERSITY IN INTACT LANDSCAPES

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Global biodiversity loss is a critical environmental crisis, yet lack of spatial data on biodiversity threats has hindered conservation strategies1. Theory predicts abrupt biodiversity declines are most likely to occur when habitat availability is reduced to very low levels in the landscape (10–30%). Alternatively, recent evidence indicates biodiversity is best conserved via minimizing human intrusion into intact and relatively unfragmented landscapes. We used recently available forest loss data to test deforestation effects on International Union for Conservation of Nature (IUCN) Red List categories of extinction risk for 19,436 vertebrate species worldwide. We show that deforestation substantially increased the odds of a species being listed as threatened, undergoing recent uplisting to a higher threat category, and exhibiting declining populations. More importantly, these risks were disproportionately high in relatively intact landscapes; even minimal human disturbance has had severe consequences for vertebrate biodiversity. We found little support for the alternative hypothesis that forest loss is most detrimental in highly fragmented landscapes. Spatial analysis revealed high-risk hotspots in Borneo, the central Amazon and the Congo basin. In these regions, our model predicts 152–273 species will become threatened under current rates of forest loss over the next 15–30 years. Given that only 8.7% of these high-risk areas are formally protected, new large-scale conservation efforts to protect intact forests are necessary to slow current deforestation rates and minimize global biodiversity loss.

GLOBAL MAPPING OF MICROALGAL BIOENERGY PRODUCTION AT MINIMAL ENVIRONMENTAL COSTS

Diego Correa, The University of Queensland; Hawthorne Beyer, The University of Queensland; Hugh Possingham, The University of Queensland; Peer Schenk, The University of Queensland; Skye Thomas-Hall, The University of Queensland

Replacing fossil fuels with renewable energy sources is fundamental to achieving targets in greenhouse gas emissions and halt global warming. Biofuels can help in substituting a significant proportion of fossil fuels used for the transport sector. However, current biofuel production systems compete with agricultural lands and biodiverse landscapes, leading to biodiversity losses. Microalgal systems grown in non-arable areas would help in reducing conflicts with food production and biodiversity conservation while providing bioenergy. Based on a GIS multi-criteria decision analysis, we identified suitable areas for microalgal cultivation at a global scale, aiming for the maximization of profitability and the avoidance of biodiverse areas and prime agricultural lands. The results are then overlapped with areas of high ecological importance. Our analyses help in providing spatially explicit scenarios for microalgal cultivation at a global scale, and in the understanding of potential spatial conflicts between bioenergy production and biodiversity conservation in the world.

GLOBAL META-POPULATION VIABILITY ANALYSES OF THREATENED SEABIRDS SCALING UP RISK ASSESSMENT

Diana Ruiz, University of California Santa Cruz

Assessing endangered and threatened species' extinction risk is a key component in prioritizing their protection and management plan selection. However, extinction risk assessment is largely either reliant on global population trends that may miss significant metapopulation dynamics or is species specific. Here we offer meta-population viability analyses as a solution that captures subpopulation-level interactions and can scale to the taxon-level. Seabirds are generally well studied and represent the most threatened marine group, making them an ideal taxon to pilot this tool. We employ a custom built meta-population viability analysis (mPVA) to assess the current extinction risk of all insular breeding seabird species designated as threatened, endangered or critically endangered by the 2016 IUCN Red List. This demographic approach unifies data pooled from extensive databases, grey and peer-reviewed literature, and expert review. Further, we quantify the unique threats posed at each breeding island, worldwide. Our results identify the seabird species at the highest extinction risk. Our findings also highlight variation in extinction risk across seabird families, identifying Procellariidae as the most threatened family. Geographic overlaps in habitat and threat pinpoint opportunities for additive benefit in potential management plans. These results aid prioritization of species by providing managers with a rigorous, adaptive assessment tool that can be used across the seabird taxon. This mPVA approach to threatened species assessment quantifies threat impact, incorporates metapopulation dynamics, and scales to the taxon level.

GLOBAL WILDLIFE TRADE AND RISK OF IMPORTING INFECTIOUS PATHOGENS INTO THE UNITED STATES

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The recent outbreak of a newly described chytrid fungus (*Batrachochytrium salamandrivorans*) in several European salamander populations—resulting from introduced Asian salamanders—highlights the risk to native wildlife from international trade of live animals. In 2015, over 122 million live wild and exotic animals were imported into the US from 124 countries with minimal health surveillance. Imported animals, either wild-sourced or captive-bred, can harbor infectious pathogens harmful to native wildlife if accidentally or deliberately released into the wild. It is reasonable to assume that risk of importing infectious pathogens varies according to conditions in the exporting countries and is a function of propagule pressure, i.e., the abundance and diversity of imported species per country. To better understand disease risk, we examined 17 years of USFWS import data and quantified composition, magnitude, and source (i.e., exporting country) of live bird, mammal, reptile, amphibian and fish imports. We created terrestrial and aquatic infectious disease threat indices by first evaluating the relative probability that countries will export infected animals and then incorporated propagule pressure into the risk framework. On average, 750 genera, 1,120 species, and 185 million individuals were imported annually, with fish comprising almost 97% of imports. Sixty percent of annual imports were captive-bred individuals; reptiles were the most abundant wild-sourced taxa (70%). Over 200 countries exported live animals to the U.S. during the study period with roughly 40% exporting annually. Southeast Asian countries dominated the export trade and ranked high for infectious pathogen risk. These results are being used in a broader pathogen trait-based import risk assessment.

HIGHLIGHTING INVASIVE AFRICANIZED-HONEY BEES AS AN INCREASING THREAT TO THE ENDANGERED LEARS MACAW

Erica Pacífico, Estación Biológica de Doñana; Roberta Cunha, Lear's Macaw Research and Conservation Project; Caroline Efstathion, University of Florida; Thiago Filadelfo, Lear's Macaw Research and Conservation Project

Lear's Macaw (*Anodorhynchus leari*) are endangered and endemic to the Caatinga Dry Forest in northeast Bahia, Brazil. They nest exclusively in natural cavities in sandstone cliffs. Monitoring breeding biology since 2008, we observed the occupation of historical breeding sites as a sign of population expansion after recent recovery. However, the quality of this habitat is compromised by invasive Africanized bees (Apis cf.melifera) that occupy an increasing number of cavities potentially used by the Lear's Macaw in the cliffs. Where cavities were occupied by invasive bees, we observed frequent fights among breeding pairs, double nest occupancy resulting in nesting failure or death of breeders, all signs of saturation of the breeding sites. Experimentally, bee-hives were removed from three macaw historical nesting cavities, which were reoccupied by macaws immediately in the next breeding season. We found 56 hives in six nesting sites, of which 34 were active with bees, and 31 were close to macaw nests. Local farmers and native indigenous people report that the invasive process started 40 years ago, and that native bee species (Meliponini tribe) have been declining to possibly local extinction levels, together with disappearance of meliponiculture practices, while honey-gathering practices using smoke frequently resulted in fires in the dry forest and facilitated parrot poaching in nest cavities on the walls. Our results indicate that the removal of Africanized bee colonies from the macaw's breeding sites will increase the number of available cavities for nesting. Thus, we

suggest that an intensive and continued eradication program, with social and environmental development action plan, could gradually replace uncontrolled apiculture practices and rescue melinipoculture practices lost in the local communities. This management will bring environmental awareness and avoid saturation of resources of constricted parrot populations in the Caatinga forest.

HIGH-RISK AND HIGH-RETURN PHD RESEARCH ON LITTLE-KNOWN SPECIES IN A LITTLE STUDIED AREA

Ai Suzuki, Kyoto University

The status of many species is still poorly known, and it has raised concern about unrecognized decline/extinction of these little-known species under ever-growing anthropogenic pressure. Despite its importance of fulfilling such knowledge gap in conservation, little-known species is often not the popular choice for PhD research, especially in a little studied area, which appear to be too risky. However, given the possible contribution to conservation science, it may be worth to examine research feasibility on little-known species using rapid development survey techniques, and take opportunities if possible. Here, an example case of little-known small carnivore is given, large-spotted civets Viverra megaspila in northern Cambodia. The study area is assumed as one of conservation priority areas, but, to best of my knowledge, no research was conducted to investigate the status of large-spotted civets. In this area, not only for this species, but also for other mammals, ecological research was limited owing to prolonged political stability. Starting with confirmation of current occurrence of this species in the area, camera trap survey with mathematical models made possible (1) to identify important environment variables for the species, and (2) to estimate the density as the baseline data for monitoring. Additionally, by-catch data also offered the first photographic confirmation of occurrence on two felids, and current mammal records in a little studied area. These information is the very first step toward better understanding the status of the species and conservation. By this case, I do not intend to suggest PhD research on little-known species, but rather hopefully to encourage to examine research feasibility for little-known species as well as reviewing what we do not know on relatively well-studied species.

HIGHWAY TO HELL ROAD NETWORKS DECREASE GENETIC CONNECTIVITY IN A SMALL MAMMAL

Morgan Gray, UC Berkeley; Adina Merenlender, Hopland Res & Ext Ctr

By mid-century the combined length of all roads on earth will be enough to encircle the planet more than 600 times; with expanded impacts on wildlife including mortality, habitat loss, and population isolation. One way to mitigate the impacts of roads to sustain life on Earth is to conserve and restore habitat connectivity, allowing species to persist around human development. We take an interdisciplinary approach in combining spatial and genetic data to improve our understanding of structural and functional connectivity in human-modified habitat. Spatial models can predict structural connectivity, and genetic approaches can reveal how land use barriers influence gene flow among populations – a measure of functional connectivity. However, few studies have compared structural connectivity model predictions with functional connectivity in the form of quantified road impacts on gene flow, nor shown evidence of population isolation associated with fragmentation. Here we evaluated the genetic diversity and structure of mitochondrial DNA sequences for 61 ground squirrels from populations separated by a major freeway. Genetic structuring was assessed using interpolation analysis, and landscape permeability was evaluated with Mantel tests and resistance surfaces. Based on haplotypes across 615 base pairs, the genetic similarity among populations on the same side of roads was higher than among populations separated by major roads, in particular, a large freeway. These results indicate that habitat fragmentation by roads was a barrier to gene flow in ground squirrels, resulting in quantitative differences in genetic structure and diversity between populations. Considering both structural connectivity associated with land use and functional connectivity at the molecular level can provide insight for conservation management and land use planning to sustain wildlife populations amidst expanding development.

HOT, HUNGRY, AND TIRED: INDIVIDUAL-BASED MODELS OF ANIMAL DISPERSAL USING ENERGETICS AND CLIMATES

Matt Malishev, University of Melbourne

A prevailing challenge in ecology is accurately forecasting species responses to environmental change. Constraints on dispersal interact in complex ways with the physiology of the animal (metabolism) and physical environment (food and microclimates), but can be modelled using physical principles of energy and mass exchange. Under

a changing environment, a first principles framework of how animals budget their energy, heat, and water usefully captures individual movement and dispersal potential by connecting the common, key drivers sensitive to this type of change. We model these constraints in a spatially explicit individual-based model (IBM) to simulate how animals survive in landscapes of varying food and weather. To illustrate the model, we run simulations of the Australian sleepy lizard Tiliqua rugosa under different movement strategies (optimising and satisficing) in contrasting habitats of varying food and shade. By explicitly incorporating physiology, behaviour, movement strategy, and movement costs, we generate activity and time budgets, home range outputs, spatial movement patterns, and life history consequences under user-defined configurations of food and microclimates. Our results show 1) the extremes of movement behaviour is consistent with feeding requirements (passive movement) and microclimates (active movement), 2) using general mechanisms such as energy use can realistically capture home range size, and 3) a satisficing movement strategy is more efficient in energy costs despite similar heating and cooling rates to optimising movement, which was energetically more expensive and returned no additional benefit in metabolic fitness outputs. Using the general mechanism of energy use, this type of modelling provides a bottom-up framework to understand complex movement patterns and behaviour for different scales and taxa, as well as forecast future responses of species to novel habitats under certain human-induced climate change.

HOW CAN GLOBAL EVIDENCE BE USED TO MAKE LOCAL CONSERVATION DECISIONS?

William Sutherland, University of Cambridge

Many areas of policy combine the global evidence to give an overall effect, for example using meta-analysis. This may work acceptably in medicine where the response of different groups of humans are likely to be similar, but in conservation the details of the precise habitat, species or social condition is likely to have a considerable influence on effectiveness. How can you convert a mix of papers differing in quality, effectiveness and location into a policy recommendation? One option is to just consider evidence from the region, but this still may exclude very relevant studies from similar habitats elsewhere or include dissimilar, but closer, studies. To overcome this major hurdle in evidence-based conservation, we devised the Local evidence assessment tool. This is linked to the www.ConservationEvidence.com database, which has collated and reviewed the evidence for effectiveness for over a thousand interventions, with another thousand in preparation. It presents each piece of evidence to the practitioners who then assess, on a five-point scale from 'similar to 'dissimilar', the similarities in intervention, species involved and habitat between that study and the current problem being considered. This open access tool database already contains an assessment of the rigour of the design and the effectiveness. The tool converts these into a measure of the strength of certainty (how good the evidence is for the local conditions) and effectiveness (whether the intervention is likely to work for the local conditions). It then converts these into categories such as 'Beneficial' or 'Likely to be beneficial'. We imagine a practitioner or policy maker wishing to know the effectiveness of a given intervention for a given species or community in a given location. The tool will enable them to carry out such a review in an hour or so (depending on the number of studies). I will describe how the outputs can be incorporated in decision making.

HOW CAN THE CONSERVATION SOCIAL SCIENCES IMPROVE CONSERVATION?

Nathan Bennett, University of British Columbia

It is often claimed that conservation and environmental management decisions should be based on the best available evidence. For conservation practitioners, managers and policy-makers, this requires an understanding of both the natural and human dimensions of environmental issues. The term "human dimensions" refers broadly to the set of social, economic, cultural, political, and institutional considerations related to a problem. The conservation social sciences are one means through which we can seek to understand the human dimensions of conservation. This talk will present the published results of a working group that was convened at the North American Congress for Conservation Biology in 2014 that examined the scope, focus, tools and contributions of the conservation social sciences. To illustrate how social science can lead to improvements in conservation practice, this talk will then draw from several research initiatives that sought to better understand and integrate the human dimensions into marine planning in Mexico, marine protected areas in Thailand, large-scale marine protected area management globally, and terrestrial conservation in Canada. Finally, I will discuss how the results of social science might be communicated more effectively to guide conservation policy and practice at local and global scales.

HOW DO GLOBALLY CHANGING MANGROVE FRAGMENTS IMPACT EXTINCTION RISK OF ENDEMIC BIRDS?

Ryan Huang, Duke University; Chandra Giri, Environmental Protection Agency; Stuart Pimm, Duke University

Habitat loss and fragmentation is one of the greatest threats to species' persistence, a hazard most dangerous to small-ranged endemic species. Mangroves are one of the most rapidly disappearing ecosystems on the planet and the extent of fragmentation is constantly changing. Here we use a combination of global maps of mangrove cover at a 30m resolution through time, mangal endemic species' ranges refined by habitat, and occupancy metapopulation models to calculate relative measures of extinction risk for species across the globe. We will show how this risk is changing through time, which regions are experiencing the most change, and show how conservation practitioners can identify specific forest patches that are key stepping stones in allowing metapopulation persistence. Together, these data and results provide a practical approach to detecting at risk species, regions, and patches across the globe in order to prioritize conservation planning at a local level.

HOW FISH COMES TO THE TABLE? A VIEW OF FOOD ECOSYSTEM SERVICE ASSOCIATED WITH FISHING IN COLOMBIA

María Helena Olaya Rodríguez, Intituto de investigación de recursos biológicos Alexander von Humboldt; Alexi Cusva, Universidad Nacional de Colombia; María Doris Escobar Lizarazo, Universidade Federal do Amazonas; Carlos A. Lasso, Instituto de investigación de recursos biológicos Alexander von Humboldt; Maria Londono, Instituto Alexander von humboldt, Jorge Velasquez, Instituto Humboldt

Quantifying ecosystem services (ES) has become an important task to strengthen the relationship between biodiversity science and conservation decision making. After the environmental crisis caused by the 2010-2011 La Niña event, the Colombian government urged its research institutes to map Colombian wetlands to enforce their protection and minimize human and economic losses in future events. We took on the task of assessing food provisioning ES afforded by wetlands using production and demand data collated by the National Agency for Fisheries and Aquaculture (AUNAP). These data allowed us to quantify and map this ES, by identifying 1) areas supplying the ES, 2) areas with the beneficiaries of the ES and 3) flow of the ES that connect supply and demand of the ES. We included in our analyses information on species distributions along with their degree of threat. Our results indicate that the basins in Colombia with the greatest richness of fish species are the Orinoco and Amazon basins. However, the basins that have the highest provision of the ES are the middle and lower basins of the Magdalena River where the largest number of direct beneficiaries of the service (fishermen that consume fish) is located along with the Amazon basin. Importantly these three basins have the highest number of threatened species. Major cities (pop. > 500.000 inhabitants) were identified as the main indirect beneficiaries of the service (through national trade), which demand ES mainly from the basins with the highest provision. This places a high pressure on fisheries and fishermen from the Amazon and Magdalena basins. Our work represents a first step towards mapping food provisioning ES in Colombia and is an important input for the development of wetlands' management regulations.

HOW JUST? DEFINING AND MEASURING SOCIAL EQUITY IN CONSERVATION

Rachel Friedman, University of Queensland; Nathan Bennett, University of British Columbia; Christopher Ives, University of Nottingham; Elizabeth Law, University of Queensland; Jessica Thorn, Colorado State University; Kerrie Wilson, University of Queensland

Social justice and safeguards in conservation are increasingly garnering attention - through international treaties (e.g., Convention on Biological Diversity benefit sharing mechanisms), organizations' missions, and government efforts to address both social and environmental concerns. Environmental decisions have been fraught with ethical implications, often dealing with issues of the common good, timescales that involve intergenerational interests, and values of non-human entities. However, what constitutes a "socially just" solution takes different forms depending on the people involved, their values and epistemological framing, the context of the system, and the underlying motivations. At present, it is unclear how well applied conservation research captures this plurality of social equity, with little discussion how different notions of equity might come into conflict, or how solutions considered "equitable" may not be universally "good" or well-received. This systematic review analysed studies examining social equity in relation to conservation actions, to understand how broadly the equity concept is developed and applied within conservation research. We described the dimensions of equity studies cover (i.e., distribution, participation, recognition, and context), finding studies predominantly assess the distribution of costs and benefits, and participation in conservation decision-making. Conservation research often implicitly addresses issues

related to equity even when not the primary focus, but studies also frequently fail to explicitly draw on existing theories and frameworks. Given the growing impetus to capture and understand the complex realities of conservation in socio-ecological systems, there is a clear need for the field of conservation to engage more deeply with different notions of equity when studying, planning, and implementing actions.

HOW THE PROTECTION OF OLD-GROWTH FOREST COULD CREATE A BETTER TOMORROW FOR LOCAL COMMUNITY

Wieslaw Walankiewicz, Siedlce University of Natural Sciences and Humanities; Dorota Czeszczewik, Siedlce University of Natural Sciences and Humanities; Agnieszka Ginter, Siedlce University of Natural Sciences and Humanities

The Białowieża Forest (c. 600 sq. km) is the last remnant of the primeval lowland European forests, which is protected for more than 600 years. For a hundred years, a large part of the forest is managed (MF), while only small part is protected as the Białowieża National Park (BNP). Despite of the changes caused by logging, planting and removal of dead trees, species diversity of the whole forest (e.g., >11,000 animal species) is still much higher than in other European forests. However, biodiversity in MF is lower than in the BNP. The Białowieża Forest is frequently visited by tourists (> 120,000 people a year). A significant part of the tourists are nature lovers, birdwatchers, mammals' observers. The aim of study was to estimate of income from nature tourism and comparison with the income brought by forest management (mostly logging) in 2016-2017. We conducted a valuation of non-market goods using method travel and subsistence costs (survey of visitors in the Białowieża). This can be considered as the value of the Białowieża Forest or implied price that people are willing to pay to protect this form of land use. Preliminary calculations showed that the average income per capita of the local inhabitant coming from nature tourism was much higher than income per capita from commercial exploitation of the forest. One of the main reason for the visits of foreign tourists is the possibility to observe rare species of birds. It follows that, protection of the whole Białowieża Forest as a national park would bring much more profits than logging. It is important that, money from the sale of timber goes into one large state-owned company, while income from ecotourism goes to many members of the local community.

HOW TO ACHIEVE CONSERVATION OUTCOMES AT SCALE? AN EVALUATION OF SCALING PRINCIPLES

Willow Battista, Environmental Defense Fund

The importance of scaling initiatives that promote conservation is almost universally recognized. But how is scaling best achieved? We empirically evaluated the relationship of a list of factors from across disciplines that have been postulated to facilitate successful scaling to the degree of scaling success achieved in 56 case studies from a variety of sectors. We identified 23 factors that are significantly associated with successful scaling, defined as self-replication: an innovation that is congruent with local sociocultural patterns, takes advantage of existing scaled infrastructure, and facilitates a paradigm shift; adequate resources and constituencies for scaling, secured from the start, drawn from both within and outside the system; pilot sites that reflect conditions at future sites; clear and deliberate scaling expectations and strategy; capitalization on economies of scale; a project team that has a unifying vision, includes both individuals who helped design the innovation and members of the target audience, and empowers users with the requisite skills; target audiences that take ownership of the project; the provision of long-term support systems; ongoing learning about, and direct management of relevant factors influencing scaling; targeted marketing and dissemination efforts; and the evaluation of scaling success indicators. We also explored correlations between these principles, and identified a subset that together explains nearly 40% of the variance in success. Our results suggest that for scaling to be successful: 1) scaling must be considered at all stages of a project; 2) the context must be managed and barriers to scaling must be identified and removed; and 3) deliberate attention must be paid to scaling methods, marketing and dissemination efforts, and long-term monitoring of scaling progress.

HUMAN COSTS OF ENFORCEMENT AND COMPLIANCE IN NO-TAKE MARINE PROTECTED AREAS (NTMPAS)

Sofia Castello Y Tickell, University of Oxford; E.J. Milner-Gulland, University of Oxford

Enforcement and compliance have been identified as key to the ecological effectiveness of no-take Marine Protected Areas (NTMPAs), which prohibit resource extraction in the marine realm. However, the diverse human costs of complying with and enforcing NTMPA rules have received little attention in comparison to the ecological benefits. As coverage of NTMPAs continues to rise worldwide, understanding human costs is important to the successful

establishment and management of social relations around MPAs. Using key informant interviews and an online survey, this study identifies 18 human costs of compliance and enforcement and analyses their prevalence in time and space, as well as providing some suggested approaches to mitigating these costs. Results reveal transparency and communication in the establishment and management of NTMPAs, including engagement and education of local communities and training of enforcement officers, are key to mitigating the human costs of compliance and enforcement felt by enforcers and illegal and legal resource users.

HUMAN-LION CONFLICT ON THE EDGE OF CATTLE-DOMINATED AREAS IN THE WESTERN OKAVANGO DELTA, BOTSWANA

Carolyn Whitesell, University of California, Davis; Ben Sacks, University of California, Davis; Christiaan Winterbach, Tau Consultants, Pty Ltd

The African lion (*Panthera leo*) is a species of conservation concern that is threatened because of increasing conflict with people. In the western Okavango Delta, Botswana, lions often move from protected areas to cattle-dominated areas, where they kill cattle and risk being killed by farmers. Understanding the movement ecology of lions in such areas and gaining information on livestock depredation events is therefore fundamental to effective livestock management and lion conservation. As part of a larger project on conflict between farmers and large carnivores in the western Okavango Delta, we studied human-lion conflict from both the lions' perspective and local farmers' perspectives. We fitted GPS satellite collars on lions living along the periphery of Habu Village and adjacent Wildlife Management Areas. All collared lions were recorded crossing from the Wildlife Management Areas into the cattle-dominated areas and all were implicated in livestock depredation events. Four of these lions were killed by farmers in retaliation for killing livestock. We will present data on the seasonal frequency of crossings into the cattle areas by these lions, the relationship of lions' movements to diel and seasonal cues, the relationship of lions' movements to wild and domestic prey distribution, and the relationship between lion movement patterns and distance to the fence and cattle posts. In addition, we conducted questionnaire surveys of farmers living in the Habu Village area. We will present data on livestock husbandry practices and seasonal and diel patterns of livestock depredation by carnivores, and will relate this information to the lion movement data.

IDENTIFYING PRIORITIES AND TRADE-OFFS WHEN PROTECTING BIODIVERSITY AND ECOSYSTEM SERVICES IN BOLIVIA

Constance Fastré, University of Antwerp; Erik Matthysen, University of Antwerp; Hugh Possingham, The University of Queensland; Diederik Strubbe, University of Antwerp

The slopes of the Bolivian Andes north of the city of Cochabamba have been inhabited by humans since pre-colonial times. Land conversion in the area has led to extensive deforestation of native *Polylepis subtusalbida* woodlands, a highly threatened ecosystem which is home to many endemic bird species. Reduction in forest cover not only impacted biodiversity, but also caused recurring landslides and floods in downstream urban areas, leading to the 1962 designation of the Tunari National Park. However, land-use regulations remain a source of conflicts between the local communities who practice small-scale agriculture and animal husbandry, and citizens interested in protecting the native vegetation. In this study, we use the conservation planning tool Marxan and its advanced version, Marxan with Zones, to identify priority sites for achieving biodiversity conservation (native habitats and bird species) and ecosystem services provisioning (especially water provision and erosion control) while minimizing conflicts with agricultural practices. We used a variety of data gathered through field work, existing local databases, expert opinion, remotely sensed products and estimates of bird species obtained from MaxEnt models. We apply scenario planning to evaluate how priorities change when we plan for biodiversity conservation alone, and when we aim for multiple-objectives simultaneously. We report on how different scenarios impact the opportunity costs experienced by the local communities and make robust recommendations for future land-use planning in this highly biodiverse region of the world.

IMPACT FORECASTING PREDICTING THE LIKELY IMPACTS OF CONSERVATION INTERVENTIONS

Louise Glew, World Wildlife Fund; Andrew Fayram, World Wildlife Fund; Shauna Mahajan, World Wildlife Fund; Rebecca Snyder, World Wildlife Fund; Martha Stevenson, World Wildlife Fund

Biodiversity conservation requires decision-making under substantial uncertainty. While the empirical evidence base is expanding rapidly, conservation practitioners and policymakers face considerable challenges estimating likelihood and magnitude of a specific social or ecological impact when designing interventions, or examining the relative efficacy of multiple intervention types in a given context. We develop a series of Bayesian models

for a portfolio of conservation interventions (including protected area financing, certification schemes and policy agreements) to examine the likely magnitude and direction of conservation impacts. We integrate quantitative and qualitative data on the causal relationships hypothesized by each intervention's theory of change as Bayesian priors to forecast the avoided deforestation and degradation over time. We vary both the structure and probabilities of our Bayesian models under different scenarios to capture large-scale social-ecological trends, as well as stochastic shocks. We apply these methods to conservation interventions in six tropical forest nations, finding considerable variation in the likely magnitude of avoided deforestation by 2020 among interventions and countries. Predicted avoided deforestation is dependent on deforestation rates at the inception of an intervention, the effectiveness of individual intervention types at reducing deforestation, as well as critical 'initiation' steps in the theory of change (e.g., political will), but less dependent on large-scale social-ecological change. These impact forecasts provide quantitative estimates of likely conservation impacts, while accounting for uncertainties, enabling decision-makers to explicitly examine how the assumptions underpinning an intervention influence impacts. In so doing, impact forecasting can provide novel insights to conservation planners, practitioners and policymakers about the likely impact of conservation interventions.

IMPACTS OF SEASONS AND SITE EFFECTS ON PATHOGENS WITHIN AMPHIBIAN COMMUNITIES

Ariel Horner, University of Central Florida; Emily Karwacki, University of Central Floirda; Cassandra Sarria, University of Central Floirda; Anna Savage, University of Central Floirda

Emerging infectious diseases in amphibians have contributed to their population declines worldwide. We collected over 900 tissue samples from amphibians in wetland communities over two years to monitor and assess pathogen dynamics in an amphibian hotspot, Florida. Three pathogens, *Batracochytrium dendrobatidis*, *Ranavirus* and *Dermomycoides sp*., were targeted. We examined both the prevalence and intensity of each pathogen for multiple species over several seasons and latitudes, as well as the potential for co-infection, to better understand the infection cycles present at our sites. We found that temperature and precipitation interact with the targeted pathogens' prevalence and intensity, and that co-infection of certain pathogens did occur throughout the year. Our research is the first continuous monitoring effort of multiple pathogens in the state and our results lend themselves to the better understanding of the disease dynamics these pathogens present. Our data are important for helping inform conservation practices of vulnerable amphibian species, as well as informing managers of best practices for disease monitoring.

IN PURSUIT OF SUSTAINABILITY – EXPLORING BARRIERS AND OPPORTUNITIES FOR SUSTAINABLE CASHMERE PRODUCTION IN MONGOLIA

Zara Morris-Trainor, University of Aberdeen; Charudutt Mishra, Nature Conservation Foundation; Michelle Pinard, U Aberdeen, Plant & Soil; Steve Redpath, University of Aberdeen

Global trade in cashmere wool may be leading to overgrazing and pasture degradation in the high altitude rangelands of Central Asia. This may have potentially negative consequences for the resilience of pastoral communities and the conservation of native wildlife. With changing grazing practices and increasing goat numbers in Mongolia, there is an urgent need to determine the impact that domestic goats are having on native wild grazers like ibex and on their endangered predator, the snow leopard. In Mongolia's South Gobi Province, the Tost Nature Reserve (NR) is important both for wildlife conservation and cashmere production. Four years of autumn ibex distribution data have been collected from the NR using the double-observer survey method (Surywanshi et al. 2012), however no information currently exists regarding the distribution of goats in the areas of Tost that are shared by ibex. To address this gap, we used winter ger (herder camp) locations as an indicator of goat distribution and explore whether goats are affecting ibex spatial distribution in the season of highest resource competition. Winter ger locations within the key ibex habitat of the NR were buffered according to the average goatherd home ranges, which we estimated with the GPS collaring of 10 goats. A mixed-effects resource selection model (Gillies et al. 2006) revealed that topography (slope and ruggedness) was the strongest predictor of ibex distribution, but that goats also had a significant impact on ibex distribution, with ibex selecting habitat away from goat grazing areas. These results support concerns regarding rising cashmere production on wild ungulates and highlight the need for further investigation of resource competition between the two species. Understanding the impact of domestic livestock is a vital aspect of developing sustainable grazing practices that promote the coexistence of people and wildlife on Mongolian rangelands.

INCORPORATING PARALLEL EVOLUTION AND HYBRIDIZATION IN DELINEATING UNITS UNDER SPECIES-AT-RISK ACTS

Paul Wilson, Trent University; Micheline Manseau, Landscape Science and Technology Division, Science and Technology Branch, Environment and Climate Change Canada, ECCC

Policy guidelines on establishing conservation units under Canada's Species-at-Risk Acts (SARA) and the US Endangered Species Act (ESA) apply criteria of "distinct" and "significant" to establish Designatable Units (DU) and Distinct Population Segments (DPS) in the US, respectively. The "significant" criterion considers intraspecific divergence inferred from genetic, biogeographic or ecozone adaptation. Absent from these criteria are more complex evolutionary scenarios. First, the evolution of ecotype forms independently through the parallel evolution of divergent intraspecific lineages. Second, secondary contact between divergent lineages resulting in hybrid populations that subsequently diverge from the contributing source parental populations. We consider these two evolutionary scenarios within the establishment of DUs within Canadian caribou. Woodland caribou are generally accepted to have evolved south of the glacial extent, but the boreal ecotype in the northern part of their range co-occurs with caribou that have a Beringian origin. Bayesian computation showed that unlike the southern-evolved woodland derived boreal ecotype, the same ecotype in central NWT has a Beringian origin and arose independently from a common lineage with barren-ground that pre-dates the Last Glacial Maximum supporting the boreal ecotype of caribou is comprised of two evolutionary assemblages that should be considered separate DUs. The second scenario involves post-Pleistocene contact of woodland and barren-ground caribou with introgressive hybridization and subsequent divergence deriving a distinct eastern migratory ecotype. Incorporating more complex evolutionary scenarios within guidelines establishing conservation units is critical to not inadvertently pool divergent populations into a single unit under a model of parallel evolution, and further needs to recognize the contribution of introgressive hybridization in the divergence of populations under the "significance" criterion.

INFLUENCE OF FOREST STRUCTURE ON SUMATRAN ORANGUTAN NEST ECOLOGY IN RECOVERING LOWLAND FORESTS

John Abernethy, Liverpool John Moores University

Orangutan nests are widely used for estimating their population numbers and densities, and also enable research into their habitat preference and ability to cope with change. Given that orangutans spend such significant proportions of their lives at nests we should better understand their nest ecology and site preference. The forests of Gunung Leuser National Park in Langkat present a great opportunity to investigate orangutan numbers and preferences across a gradient of human influence, from a naturally recovered lowland dipterocarp forest at Sikundur to recent human-led reforestation of a former oil palm plantation at Sei Betung. Results show a bias towards areas of least disturbance and human activity and selection of taller, larger trees better able to provide safe and stable nesting sites, in the reforestation site they will be less selective due to the scarcity of these trees. Orangutans in Sikundur show a clear bias for taller trees ($t1307=4.76$, $p=<0.0001$, Ψ 7df = 56.91048, $p= <0.0001$) and those with greater stem diameters (Ψ8df = 89.932, $p= <0.0001$) ad similar results were also found in Sei Betung even though the overall habitat quality is much lower. Preference was found for certain tree species with 8 of the 52 species hold more than 50% of nests. Multiple nests within the same tree are far more common in Sei Betung than Sikundur, 27.7% of nest trees versus <5% suggesting quality nesting trees are much scarcer, forcing orangutans to share resources and into close proximity. Lower resource availability in Sei Betung is also supported by the fact of most of the nests being found clustered around old oil palms or closer to the plantation than the primary forest. This could have implications through the spread of disease, competition for nesting sites and negative social interactions.

INTEGRATE PEOPLE PERCEPTION OF CULTURAL ECOSYSTEM SERVICES INTO NATURE CONSERVATION MANAGEMENT

Claudia Canedoli, University of Milano Bicocca; Craig Bullock, UCD School of Geography, Planning and Environmental Policy, University College D; Marcus Collier, UCD School of Geography, Planning and Environmental Policy, University College D; Deirdre Joyce, UCD School of Geography, Planning and Environmental Policy, University College D; Emilio Padoa-Schioppa, Department of Earth and Environmental Sciences, University of Milano-Bicocca, Mi

Urban forests provide a wide range of ecosystem services. Among others, cultural ecosystem services (CES) are one of the most important and easy perceivable from the perspective of urban dwellers. Integrate nature conservation and CES preservation is a challenging goal to undertake to enhance cities resilience, and urban forests represents an ideal model to developed effective management strategies. In this study, we aimed to

better integrate CES valuation into the management of a regional natural park in the city of Milan (Italy). In order to achieve this goal we: (i) identified which were the cultural benefits perceived by park users and map them through participatory mapping (PPGIS), (ii) identified and map the cultural benefits arising from park management (management perception), (iii) through a comparison analysis explored if the benefits perceived by citizens and park management matched or mismatched by (a) type and (b) distribution and (iv) discussed with the park management if the type of data collected and the process followed might be effectively informative for decision-making process. Data on citizens and park management perception of CES were collected with public workshops and interviews and analysed with GIS-based techniques. Maps of individual benefits and aggregated maps of benefits richness were produced and compared. The resulting maps showed places that have bundles of different values, and other places with clusters of the same value type, as well as hotspot and cold spot of CES. Comparison analysis revealed which areas of the park showed matches or mismatched in cultural benefits perception. This methodology allowed to produce informative spatial data about CES perception and addressed useful methodological indication about how to integrate this data into land use planning. The study helped to support the need of developed a natural park where nature conservation and cultural services protection are part of the same conservation design.

INTERPRETING SCIENCE IN CONFLICTS OVER RAPTOR MANAGEMENT: A TALE OF STRATEGIC USE AND TRUST ISSUES

Isla Hodgson, University of Aberdeen

The way knowledge is understood and communicated is a critical element in how conservation conflicts play out. Scientific evidence is rarely transferred linearly, but reproduced by different actors who interpret research based on their own knowledge, values and beliefs. This can be damaging, especially when diverging interpretations are relayed to the public domain via high profile organisations. Clashes in knowledge use can lead to increased friction between stakeholders and serve to exacerbate conflict further. We investigated how research was used and interpreted by six organisations central to conflict over raptors in Scotland, representing conservation to field sports. Firstly, we assessed the research focus and source (author affiliation) of research publications listed on each organisation website, using content analysis. Secondly news articles authored by each organisation referring to scientific research were subjected to line-by-line analysis, to ascertain which reports or projects were mentioned, which findings were reported and how they were interpreted compared to the original paper. This approach allowed us to analyse which knowledge sources were trusted by actors as well as how science travelled into their public output. Organisations differed in research focus and source – conservationists concentrated on illegal killing and preferred their own research, whereas shooting organisations focused on raptor impacts, and relied on governmental evidence. Actors promoted divergent interpretations of the same report, emphasising findings benefitting their own objectives, providing evidence of strategic use. This demonstrates that actors interpreted and communicated science based upon their own values and goals, but also that different knowledge sources were trusted over others. Such differences could act as barriers to collaboration. As shown by this research, understanding the use and communication of science is a critical step towards conflict mitigation

INTO DARKNESS: A JOURNEY THROUGH WILDLIFE TRAFFICKING IN INDIA

Rahul Kumar, Bhavan's College

The role of a species in maintaining the biodiversity is of paramount importance. Immense pressure due to forest loss, rapid urbanization, hunting, illegal trafficking and dilution of law and enforcement is weakening the efforts towards the conservation of these species. The situation is severe in India and other parts of Southeast Asia. Over the years, wildlife trafficking is become much more organized and is rising at alarming proportions. Therefore, to understand the severity of illegal hunting and trade, my work presents a case study based on intelligence gathering and enforcement work being carried out in the area of illegal hunting and trade of otters in different parts of India. This work was a covert operation carried out with the help of the department of forest and enforcement agencies. The prime objective of the operation was to identify the network of people of involved in illegal trade of otters. Several unconventional strategies and methods were used to achieve this objective. As part of this work, I travelled to remote locations in different states, assuming different identify in each location. The work involved working with and expanding a network of local informers, forest officials and enforcement officials, interviewing local people for intelligence gathering, identifying hunting grounds (GPS mapping) and hunting methods (tools and techniques), recording presence of otter species (*Lutrogale perspicillata, Aonyx cinereus*), its habit and habitat. Evidence gathering was done through photographs, video recording and camera traps, tracking known suspects and creating a network map, etc. A comprehensive report on the findings was prepared and shared with the law

and enforcement agencies for helping them in preparing an action plan for weeding out the menace of wildlife trafficking.

INVESTIGATING PATTERNS AND CHANGES IN THE DECLARED TRADE OF CITES APPENDIX II ANIMALS ACROSS TAXA

Ting-Chun Kuo, University of British Columbia; Amanda Vincent, Univ of British Columbia;

Increasing international trade has posed significant threats to wildlife. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was established in 1975 to address such threats, either by ending or regulating exports. For the more than 4,000 animal species listed on CITES Appendix II, their trade among 182 countries must be limited to levels that are not detrimental to the survival of the species in the wild. We used the official CITES trade database, which includes both export and import data, to evaluate the trade of Appendix II animals among these countries from 1991-2014. We aimed to (1) characterize and compare the trade networks between marine species and other taxa, and (2) identify the major export/import countries at a multi-taxa and global scale by considering the number of species in trade and trade connections among countries. We found that more countries were involved with the trade in marine fishes and invertebrates (except corals) and had more connections than trade in other taxa with a similar number of species. We also found that many countries reported trading in a high number of non-native species, indicating reporting errors in the CITES data. We discovered a South to North trade for all animal species on Appendix II; in which the USA was the centre of reported trade from 1991-2014, and some Asian countries became notable importers. Our study can help prioritize conservation efforts at global scale and guide future trade regulations.

IS BUYING OR RENTING LAND THE BEST WAY TO DEVELOP ECOLOGICAL NETWORKS ON PRIVATE LAND?

Bob Smith, DICE, University of Kent; Paul Armsworth, University of Tennessee; Humphrey Crick, Natural England; Zoe Davies, DICE, University of Kent; Nicholas Macgregor, Natural England; Assaf Shwartz, Technion - Israel Institute of Technology; Rachel Sykes, DICE, University of Kent

Most unprotected biodiversity is found outside state-owned protected areas, so developing effective conservation initiatives on privately and communally-owned land is critical. Conservationists have a long history of working with these landowners and their actions can be divided into two broad categories. The first is where they agree to take over responsibility for management, either by buying the land or agreeing on long-term leases. The second is where they "rent" the land for conservation and pay people to manage their land appropriately, often through agri-environment schemes. However, we still know relatively little about the effectiveness of these two approaches. Here we use agent-based modelling to investigate the biodiversity outcomes over time of different land acquisition scenarios, based on varying buying and renting budgets and different levels of landowner willingness to engage with the conservation authority. We found that buying land always led to better conservation outcomes, with biodiversity scores being 23.4 times higher when 100% of the budget was for buying compared to when 100% of the budget was for renting. This was mostly because buying land ensured it was managed in perpetuity, allowing the biodiversity value of each land parcel to increase over time. We also found that land-owner willingness to sell or rent their land had a large impact on results, with biodiversity scores varying by 28 times depending on the level of support. Our modelling system will next be used to incorporate more sophisticated measures of biodiversity value and investigate other scenarios for developing ecological networks on privately-owned land, such as longer-term rental agreements and conservation stewardship agreements. In this way we hope to guide future conservation policy to develop large-scale conservation areas in England and inform global strategies that account for biodiversity and stakeholder preferences when designing ecological networks.

IS THERE SUFFICIENT EVIDENCE TO WARRANT A CULL OF THE THREATENED MAURITIUS FRUIT BAT?

Simon Tollington, North of England Zoological Society

The Mauritius fruit bat is known to cause damage to commercially valuable fruit crops across the Mascarene island of Mauritius. Pressure from fruit-growing stakeholders concerned at the loss of revenue led to a government sanctioned cull of this species in 2015; an exercise that was repeated in 2016 despite concern from international conservation organisations that it could increase the extinction risk of an already threatened, island-endemic megabat. There has, perhaps surprisingly, been very little attempt to accurately quantify the damage that bats cause to fruit crops in general. We attempted to address this knowledge gap by quantifying the actual damage that fruit bats cause to lychees in Mauritius in order that any further management actions can be informed by robust evidence. Our damage assessment exercise involved selecting lychee trees in orchards and backyards and counting the fruits on a number of panicles.

We then placed protective netting over half of these panicles thereby preventing depredation by bats, birds and rats. Our controls therefore provided a measure of the number of fruit lost to natural drop (including weather), fungus, insects and disease. Using a mixed model approach, we demonstrate that significantly more fruit was lost from unprotected panicles when compared to controls highlighting the benefits of protective netting and further, that the fruit loss from non-netted panicles could be attributed to birds, bats and rats. We then assessed the fruit that had been dropped to the floor during our study and categorised them according to the apparent cause of damage. Approximately 33% of the lychees from unprotected panicles were lost due to depredation by birds, bats and rats. Of this damage, bats were estimated to cause around 40%. We used these figures to estimate that, on average, fruit bats are responsible for damaging approximately 13% of the total potential yield of a given lychee tree.

JOURNAL PRACTICE AND POLICY CAN REDUCE BIASES IN SCIENTIFIC PUBLICATION

Frith Jarrad, The University of Melbourne; Mark Burgman, The University of Melbourne; Ellen Main, Society Conservation Biology

Journal practice and policy can help address a raft of potential biases in scientific publication. Journals have an important role in disseminating research in conservation science, and a responsibility to do so without prejudice and according to best practices. However, the subjective nature of the process opens the door to potential biases – some of which editors and reviewers themselves are unaware. Some biases are acceptable, such as the exclusion of papers that do not fit with the journal's aims or scope. While other biases are not acceptable, such as excluding papers based on the author's gender, culture, or ethnicity. A recent policy change from single to double blind review at Conservation Biology has helped address potential publication biases. Other journal policy changes can help reduce potential biases, including increasing diversity on the editorial board and engaging regional editors, using transparency and reproducibility guidelines (to address bias in research results), establishing a publication-partner program to assist authors from developing nations or who do not speak English as a first language, and allowing authors to post translations of papers in their native languages in online supporting information. We recognize each initiative is only a partial solution and further seek to ameliorate potential biases in scientific publication through best practices.

KIDS CAMERA TRAP MAMMALS AROUND THE WORLD: USING EMAMMAL TO CREATE NATURAL AND CULTURAL CONNECTIONS

Stephanie Schuttler, North Carolina Museum of Natural Sciences; Liz Baird, North Carolina Museum of Natural Sciences; Rob Dunn, North Carolina State University; Kimberly Kandros, North Carolina Department of Natural and Cultural Resources; Roland Kays, NC Museum of Natural Sciences & NC State University; Rahul Khot, Bombay Natural History Society; Isabel Orendain, Museo de Paleontología Guadalajara; Daniel Rubenstein, Princeton University; Nancy Rubenstein, Princeton University; Rebecca Sears, North Carolina Museum of Natural Sciences

Given the decline of many species in the Anthropocene, citizen science is important for ecological monitoring to collect long-term and large-scale animal population data while also building public support for conservation. Reaching youth is especially important, as connections established with nature during this time can last into adulthood creating lifelong concerned citizens. Yet concerns exist about the usefulness of scientific data collected. Here we demonstrate through eMammal Academy, a citizen science camera trap program, that students as young as nine years old can collect valuable and reliable mammal monitoring data by sampling areas around school yards in class and after school programs. Students throughout India, Kenya, Mexico and the United States detected 21, 38, 18, and 14 mammal species respectively including six species on the IUCN red list. For U.S. data, we compared camera trap results collected by kids to similar dataset from a state park and found that students captured six more species and had higher detection rates for carnivores including coyotes, red, and grey foxes despite less camera trap days. eMammal Academy has been incorporated into schools using lesson plans co-created by K-12 teachers and scientists aligning state and national science standards. eMammal Academy has also had community-wide impacts including presentations by kids with local politicians, community conservation days, and national news coverage. We show that kids can contribute valid scientific data, that citizen science can align with learning outcomes and standards taught in school, and that citizen science has the potential to be an effective educational tool.

LAND USE CHANGE AND HUMAN EXPLOITATION DRIVING PRECIPITOUS DECLINES IN SOUTH EAST ASIAN BIRDS

William Symes, National University of Singapore; L. Roman Carrasco, National University of Singapore; David

Edwards, University of Sheffield; Jukka Miettinen, National University of Singapore; Frank Rheindt, National University of Singapore

The biogeographic region of Sundaland is one of the most biodiverse region of the plant and is home to ~142 species of endemic birds. The region has undergone rapid land cover change in recent decades, and this is further exacerbated by high levels of human exploitation of commercially valuable species. Here we use recently available remote sensing datasets of land cover in the region to calculate the rate of loss of suitable habitat for forest dependent birds. We also combine expert opinion with remote sensing techniques to quantify the impact of human exploitation on the populations and use the species area relationship to calculate the expected number of extinctions that are expected by 2100. We use our results to conduct the first, to our knowledge, comprehensive Red List assessment for all forest dependent species in the region. Preliminary results indicate the rapid and ongoing decline of forest in the region results in at around 30 species are in an incorrectly low threat category based on the rate of habitat decline alone. However, when we include the population impacts of hunting many more species require re-listing. Under a business as usual scenario we expect ~20% of all forest dependent species in the region to go extinct by 2020, however the pattern of extinctions will be distributed unevenly, with Sumatra likely to experience the highest rate.

LARGE CARNIVORES CAN SAVE MONEY AND LIVES IN DEVELOPING NATION CITIES

Chris O'Bryan, University of Queensland; Alexander Braczkowski, University of Queensland

Carnivores are often persecuted in human-dominated landscapes because they can kill or harm people and domestic animals. However, they can also provide beneficial services to human societies in shared landscapes. We examine the services provided by an urban population of leopards (*Panthera pardus*) to the residents of Mumbai, India, one of the world's largest cities. Using a simple model of leopard predation on stray dogs in slums surrounding the leopards' core habitat we show they can reduce the number of people bitten by dogs, reduce the risk of rabies transmission, and reduce dog management costs. We show that even this small population of 35 leopards can affect residents by saving nearly a 1,000 human lives over a decade. The indirect benefits of leopards may also include improvements in the abundance of species killed by dogs, a mesopredator management affect. These direct and indirect benefits are likely to increase in the future as the populations of people and dogs increase. This is one of the few emerging studies analyzing the benefits of large carnivores in terms of human health and well-being. We argue that the effective conservation of carnivores in human dominated landscapes is complex but there is need for decision makers to weigh both negative and positive impacts and educate local communities about the benefits of large carnivores. Furthermore, this information can be used in conservation marketing to inform the public as well as local and landscape-scale policy makers. We touch on the global implications of this work to inform conversation on the value of carnivores for effective conservation in areas of high human footprint.

LEARNING FROM THE DEVIL INSIGHTS INTO ANIMAL-CENTRIC HABITAT RESTORATION FROM TASMANIA, AUSTRALIA

Rowena Hamer, University of Tasmania; Christopher Johnson, University of Tasmania; Menna Jones, University of Tasmania

There is mounting evidence that healthy predator populations can increase ecosystem resilience, and conversely that introduced predators can have devastating impacts. Our research, based in the agricultural regions of Tasmania (Australia), focuses on the ecology and interactions of the iconic Tasmanian devil, spotted-tailed quoll and eastern quoll as well as the introduced feral cat. Our results will directly inform the actions of our partner organisations, who are undertaking restoration and conservation works in the region. These works involve protecting, restoring and connecting areas of habitat, mainly defined as patches of remnant woodland and native grasslands. Unfortunately, our perception of suitable habitat may not correspond to that of the species which we aim to conserve. In particular, 'unmappable' factors such as disease and competitive interactions may disrupt landscape-scale ecological processes and prevent persistence even where seemingly suitable vegetation is available. Our work takes an animal-centric approach to address this problem. By combining region-wide occupancy surveys with fine-scale GPS telemetry, we aim to determine the underlying processes driving observed patterns of species' distribution and abundance across the landscape. Despite the large home ranges and mobility of these carnivores, we show that there are marked differences in both their broad-scale distributions and fine-scale habitat use. As an example, the native spotted-tailed quoll and introduced feral cat, which are similar in size and have considerable dietary overlap, showed strong differences in their willingness to cross open spaces and preferences for woodland vs pasture habitats. These fine-scale behaviours also correspond to observed differences in their distributions at a regional scale. These findings

have significance beyond the local landscape, suggesting that taking an animal's point of view can increase the effectiveness of habitat restoration.

LEARNING OUTCOMES ASSOCIATED WITH A UNIQUE CONSERVATION-BASED SHORT-TERM STUDY ABROAD PROGRAM

Carlos de la Rosa, Organization of Tropical Studies/ La Selva; Jacqueline Mclaughlin, Penn State University

Short-term study abroad international experiences are the most common type of undergraduate study abroad programs in the United States. However, little empirical research exists on learning outcomes associated with the varied types of short-term programs. This study examines the impact of an embedded program in Costa Rica and Panama that offers students opportunities to conduct field research in the form of a CURE (course-based undergraduate research experience) in the field of ecology as well as numerous service-learning activities centered on conservation biology. Quantitative and qualitative survey analyses, using three different assessment instruments from three cohorts of students over three consecutive years, revealed that students benefited in both scientific research skills and knowledge domains in the field of ecology following their CURE experience, and that their cumulative field research and conservation service-oriented activities furthered their understanding of the field of conservation biology and future actions as informed citizens.

LEARNING TO LIVE WITH CANCER ADAPTATIONS IN TASMANIAN DEVIL FACIAL TUMOR DISEASE

Rodrigo Hamede, University of Tasmania; Paul Hohenlohe, University of Idaho; Menna Jones, University of Tasmania; Hamish Mccallum, Griffith University; Ruth Pye, University of Tasmania; Manuel Ruiz, University of Tasmania; Andrew Storfer, School of Biological Sciences; Greg Woods, Menzies Insititute - University of Tasmania

Devil facial tumor disease (DFTD) is a recently-evolved transmissible cancer affecting its unique host and largest extant carnivorous marsupial, the Tasmanian devil (*Sarcophilus harrisii*). Since first detected in 1996, DFTD has spread to cover more than 90% of the species' distributional range, causing population declines of up to 80%. These population declines resulted in the species listed as Endangered by the IUCN. The disease is transmitted by direct contact between infected and susceptible hosts and has been described as invariably fatal within 6-12 months after clinical signs appear. Epidemiological models predicted the extinction of the species in the wild within 20 years from the epidemic outbreak, yet, no local extinctions have been reported. However, these models assumed constant values for key epidemiological parameters such as disease-induced mortality, survival after infection and transmissibility with each generation of infection. In this study, we demonstrate differences in susceptibility and tolerance to infection across tumor lineages and provide the first evidence of devil immune responses against the cancer. These immune responses resulted in tumor regressions and the subsequent recovery of infected individuals. Our results provide the first indications that adaptive processes in this host-pathogen system are underway, and highlight the need for managing this conservation challenge from an adaptive and evolutionary framework. We suggest that conservation efforts focus on identifying potential resistant alleles to DFTD and evaluating the heritability of immune responses across generations. The Tasmanian devil and its transmissible cancer is an ideal host-pathogen system to understand how the adaptations required for populations to coexist with emerging diseases arise and evolve in nature. This adaptive and multidisciplinary framework is broadly applicable for managing and mitigating the wide-ranging effects of other emerging wildlife diseases.

LEGAL REVERSALS OF PROTECTED AREAS IN BRAZIL VIA DOWNGRADING, DOWNSIZING, AND DEGAZETTEMENT (PADDD)

Shalynn Pack, Round River Conservation Studies

As we move forward into the Anthropocene, protected areas (PAs) remain the cornerstone of biodiversity conservation – they protect forests, support local economies, and offer safe havens for wildlife. Brazil, home to one-third of the world's tropical forests and 12% of its PAs, is a global leader in PA creation and management. Despite this leadership, evidence suggests that Brazil is scaling back its PA network through a process known as PA downgrading, downsizing and degazettement (PADDD). To examine PADDD in Brazil, we documented all enacted and proposed PADDD events from 1900-2015 in a spatial database. We identified 67 enacted PADDD events, which affected 112,477 km2 and eliminated 6% of Brazil's total potential terrestrial PA estate. Hydropower and rural human settlements were the primary drivers of PADDD, a phenomenon that has been increasing in frequency since 2005. Another 27 active PADDD proposals currently threaten to eliminate 60,555 km2 of protected lands, an area over twice the size of Haiti. Our findings suggest that due to a lack of a process-based national policy for PADDD, PADDD has occurred in a sporadic, ad hoc manner without technical studies or public consultation. Given the political climate and increasing development and

settlement of Amazonia, we expect PADDD to increase in the near future. These results underscore the need for new national policies governing PADDD, requiring public consultation, technical studies, compensatory measures, and visual representation and explanation of the proposed changes. Our discussion will highlight the extent of PADDD in Brazil, review several large PADDD events that occurred in 2016, and assess the future of Brazil's protected area estate in light of recent political and social changes. What can Brazil's story teach us about how to design protected area networks that are flexible to changing social demands, yet robust in their conservation mission over time?

LESSONS FROM THREE YEARS ON THE PRAIRIE

Nina Hadley, Adventure Scientists

Grasslands are highly threatened and fragile ecosystems with only 5% of their expanses protected globally. These conditions inspired a Montana-based effort to create the largest grasslands and wildlife protected area in the continental United States beginning in 2001. In this vast landscape, however, there was a need to better understand the extent and diversity of wildlife inhabiting and migrating through the space, including the nation's largest free-roaming bison herd. To enhance this understanding, a citizen science organization helped design and implement a multi-year program to collect key wildlife data, enhance awareness of the effort, and document human experiences of living on the prairie. The organization recruited, trained and managed volunteers from the outdoor adventure community. Volunteers were responsible for collecting baseline data year-round on animals moving through the landscape to support their management and protection. After three years of data collection and volunteers hiking over 5,375 miles, the grasslands preserve covering 350,000+ acres is now empowered with an expansive wildlife dataset to plan for further conservation actions and coordination with neighboring landowners. While the program was decidedly successful, the organization learned valuable lessons leading to the creation of more rigid project-selection criteria focused on conservation impact. Additionally, more precise QA/QC measures and a clear process for screening volunteers were derived from this program. In this contributed talk, we will discuss the three-year citizen science program on a North American prairie. We will share lessons learned through our unique approach to volunteer management as well as the value of working with the outdoor adventure community. We will also highlight how this initiative enabled the refinement of our project criteria to help facilitate the achievement of tangible conservation outcomes as a result of volunteer data collection efforts.

LEVERAGING GRADUATE STUDENT INTEREST AND AGENCY NEEDS FOR CLIMATE CHANGE PLANNING

Mark Schwartz, U of Ca - Enviro Sci & Pol

State and Federal agencies within the U.S., as well as conservation NGO's, are struggling to integrate climate change into natural resource planning. Partnering with Universities provides an opportunity for these conservation organizations to garner much needed information synthesis for planning. I n parallel, graduate students are curious about how agencies and NGO's function and have an interest in developing ties with these groups to better understand their functioning. I report on a series of four projects where small groups of 3-8 graduate students have partnered with agencies (U.S. Fish and Wildlife Service, The Nature Conservancy) to provide climate change vulnerability assessments for refuges or ecosystems of particular concern to these conservation partners. Embedded as part of the UC Davis Conservation Management program, students partner with agency representatives to develop a specialized product that fits a specific need for particular kinds of vulnerability assessments. As a consequence, each vulnerability assessment is unique and follows unique protocols. These assessments include examining habitat sensitivity in Humboldt Bay National Wildlife refuge, Desert spring-dependent species vulnerability at Ash Meadows National Wildlife refuge; species of special concern for focal California ecosystems with The California Nature Conservancy; and assessing critical locations for fire management with the National Park System. Results of these vulnerability assessments range from highly to marginally vulnerable species and ecosystems, with high and relatively low uncertainty. The critical factor in each case, however, was timely partnering with organizations actively planning agency actions. The consequence is a key training and networking opportunity for students in translational science. We summarize the value of the experience garnered by students and the agencies using a brief post-project survey.

LIMITATIONS TO HIGH-ANDEAN POLYLEPIS FOREST EXPANSION AND MIGRATION IN HUASCARAN BIOSPHERE RESERVE

Laura Morales, University of California Davis

Forest patches dominated by the endemic Andean tree genus Polylepis are unique habitat for forest specialist species in the mosaic savanna landscapes found above

3500 m throughout the Andes. As high elevation ecosystems, these forests are particularly vulnerable to climate change, and climate envelope models suggest that they will need to shift their distribution to areas currently occupied by grassland in order to follow their climatic niche. Such a shift will depend on seedling colonization outside the forest. Understanding the true potential for natural forest migration requires a better understanding of the regeneration ecology of Polylepis seedlings across the forest-grassland ecotone across a range of climatic conditions. To that end, we sought to describe the regeneration dynamics and ecology of *P. weberbaueri* and *P. sericea* within Huascaran National Park (HNP) between 4000-4500 masl. Working in permanent plots across forest edges, we employed a series of replicated observational and manipulative studies (cattle exclosures, seeding, and transplanting) to generate data on seedling abundance and demography. We analyzed the combined effects of habitat type, livestock, and other abiotic environmental correlates on these parameters with generalized linear mixed models. Overall, our results indicate strong filters to natural seedling colonization of grassland by both species and identify important differences between the regeneration niches of both species that imply different susceptibilities to climate change. However, they also suggest that management of livestock densities and seeding and transplanting may be employed as strategies in assisted migration.

LINKING CONSERVATION WITH GREEN ECONOMY-STRATEGIES AND INITIATIVES IN THE WESTERN GHATS OF INDIA

Jayant Sarnaik, Applied Environmental Research Foundation (AERF)

Biodiversity conservation is one of the key sustainability challenges globally. Degradation of areas surrounding protected areas is reducing the capacity of these important conservation areas to sustain healthy population of key species. Large scale threats to conservation to these areas arise from perception gap among the key stakeholders related to use and importance of biodiversity and ecosystem services in economic growth. Private sector companies including financial institutions play critical role in deciding fate of key biodiversity areas through their decisions on investment for "development" projects. If properly guided through capacity building and on ground examples, private sector investments could be utilized for promotion of sustainable biodiversity use. Scalable success models in conservation are rare as they need long term investments. Mainstreaming the conservation of important bird areas (IBAs) through engaging the private sector could result in achieving the conservation outcomes on broader scale. Use of charismatic bird species such as Great Hornbill as flagship for conservation can help generate curiosity and passion among laymen and high net worth individuals about biodiversity resulting in increased support to conservation of habitat of these species. On the other hand, survival of healthy population of these apex bird species in buffer zones of IBAs will help in dispersal and regeneration of many rare and threatened tree species and improve health of these forests. The present communication discusses the opportunities and challenges of involving the private sector engagement for landscape level biodiversity conservation in two Important Bird Areas from the North-Western Ghats. Concrete examples of initiatives with 3 different private sector companies are provided. Opportunities for supply chain linked conservation are discussed. Lessons learnt and strategies for better engagement for mainstreaming conservation of IBAs are also shared.

LINKING SOIL MICROBIAL COMMUNITIES WITH VEGETATION ZONE AND PLANT GENETIC DIVERSITY IN MANGROVES

Hayley Craig, The University of Manchester; Jennifer Rowntree, Manchester Metropolitan University

Mangrove soils contain a diverse community of microorganisms that perform a vast array of ecological functions. As mangroves are naturally subject to frequent changes in environmental conditions, it is thought that high bacterial diversity in mangrove soils could ameliorate detrimental impacts associated with environmental disturbance. In mangrove forests of the New World, where plant species diversity is low, it is thought that intraspecific genetic diversity of plants could play an important role in controlling the diversity of mangrove associate species including soil microorganisms. A loss of plant genetic diversity can reduce a habitat's ability to cope with disturbance and if this also led to a reduction in microbial diversity the problem could be compounded. Few studies have used molecular methods to assess microorganism diversity in mangrove soils and none that we know of have looked at whether this is linked to plant genetic diversity. This study aims to assess the relationship between genetic diversity of plants and diversity of soil microorganisms in mangrove ecosystems of Florida. Leaf samples were collected from Rhizophora mangle and *Avicennia germinans* within different vegetation zones at two sites for microsatellite analysis using markers we developed for this geographic region. DNA was extracted from soil samples collected beneath each of the plants sampled. We looked at bacterial and fungal communities by amplifying 16S rRNA genes and the internal transcribed spacer (ITS) regions respectively. Terminal restriction fragment length

polymorphisms (T-RFLP) were used to assess differences between microbial community compositions. Plant and soil communities were compared between and within vegetation zones at each site. This study provides much needed information on the diversity of Florida's mangrove plant and soil communities which is important for conservation efforts and assessing potential resilience to environmental change.

LOCAL EXPERIENCES OF PARTICIPATING IN ALTERNATIVE LIVELIHOOD PROJECTS IN CAMEROON

Juliet Wright, Imperial College London; Noelle Kumpel, Zoological Society of London; E.J. Milner-Gulland, University of Oxford; Marcus Rowcliffe, Zoological Society of London

Livelihood interventions commonly known as alternative livelihood projects encourage local people to engage in activities deemed to be less environmentally damaging than traditional livelihood practices. Such projects are widely implemented in conservation, particularly around protected areas, yet the evidence-base for their effectiveness is limited. Rather than focus solely on whether alternative livelihood projects have a conservation impact, we take a qualitative approach using a theory of change to assess the robustness of assumptions underlying project design, examine implementation processes and explore multiple possible outcomes. Our findings are based on the narrative accounts of 127 randomly selected household members based in seven villages around two protected areas in Cameroon. Across the two sites, respondents reported participating in 24 different livelihood projects implemented by several different organisations. The activities promoted ranged from pig rearing and snail farming to beekeeping and cocoa farmer field schools. We compare participants' experiences of different projects to identify strengths and weaknesses in project design and implementation. We discuss the extent to which different projects achieved their intended impacts, and highlight unintended outcomes. This in-depth analysis, comparing how livelihood projects function in theory and in practice, provides a nuanced frame of references for future interventions in local communities.

LOCAL HABITAT CHARACTERISTICS DRIVE DIVERSITY OF URBAN FLORAL VISITOR COMMUNITIES

Manuel Lequerica, The University of Sydney

Urbanisation is a driver of land transformation, and its environmental impact can reach beyond the physical boundaries of cities. Floral visitor communities deliver ecosystem services in the cities, thus understanding how urban growth affects these communities is important to assure the provision of urban ecosystem services. The aim of this study was to assess how floral visitor communities were affected by urbanisation and vegetation composition in Australia's largest metropolitan area, Sydney. We surveyed insect and floral communities in 19 sites, along an urbanisation gradient, calculating species richness, composition, and diversity for both communities. We estimated the degree of urbanisation [number of dwellings] and local habitat characteristic in 100, 1000, and 2000 m radii buffers around each site to evaluate if these parameters affected the composition and diversity of floral visitor communities. The most abundant taxon was Diptera with 980 records of 69 species, followed by Hymenoptera with 789 (61 species). We found that local habitat characteristics- and not landscape urbanisation-affected floral visitor communities. More diverse and species-rich flower-visiting communities were found on sites with higher vegetation diversity. Sites with a larger area of green space had higher insect species richness and more diverse insect communities. These results highlight the importance of vegetation as a driver of insect diversity and area of reserves as driver of species richness. Our study suggests that urban ecosystems are not as hostile as they are considered to be; even in highly urbanised sites, green spaces with high vegetation diversity can support diverse floral visitor communities. Our findings are useful tools, at local scales; land managers can use them to increase plant diversity in urban parks and reserves, promoting diverse insect communities and addressing contemporary sustainability issues.

LOSS OF BALTIC SALMON POPULATIONS CAN SEVERLY REDUCE THE CAPACITY FOR RETAINING GENETIC VARIATION

Sara Kurland, Stockholm University; Ola Hössjer, Stockholm University; Linda Laikre, Stockholm Univeristy; Nils Ryman, Stockholm University

The Atlantic salmon of the Baltic Sea is a species of high ecological importance and socioeconomic value. Historically, 96 rivers entering the Baltic Sea held wild salmon populations. Hydro-electric power plant construction during the 19th and 20th centuries obstructed the salmons' migratory pathways to upstream spawning grounds in the rivers, leading to limited reproduction in the wild, and a depletion of natural - likely unique - populations. Today, wild populations remain in 30 of the rivers, of which 11 are self-sustaining. This study addresses whether the loss of separate subpopulations has reduced the overall capacity for Baltic salmon to maintain genetic variation, and if so, what the expected magnitude of

such a reduction is. We applied a novel interdisciplinary framework to model the metapopulation effective size and inbreeding dynamics of Baltic salmon prior to and after the subpopulation decline. Our modeling approach allows large flexibility in metapopulation structure. Empirical data from Baltic salmon populations assisted in parametrizing the model. Preliminary results show that with subpopulation sizes, migration rates, and migration models aimed at mimicking Baltic salmon population structure, metapopulation effective size is drastically reduced following the loss of separate river populations. The reduction exceeds the loss expected based on the proportion of populations lost by orders of magnitude. This indicates that the capacity of the Baltic salmon to maintain genetic diversity and adapt is likely seriously compromised as a consequence of local extinctions. The future survival and adaptive potential of the Baltic salmon relies on management efforts retaining remaining wild populations and restoring populations in rivers that have lost their local stocks.

MAKING THE MATRIX MATTER IN INDIA: A LANDSCAPE-CENTRIC APPROACH AND UNINTENDED WILDLIFE SPACES

Diya Paul, Rutgers, The State University of New Jersey

Wildlife conservation in the Global South is often contentious due to human-animal conflict and a rift between conservation and development agendas. Although conservation efforts in anthropogenic landscapes are gaining traction, a protected area (PA) centric approach still dominates the discourse. In India, more than 80% of forested area lie outside PAs yet conservation policy and management has not moved towards a landscape centric approach. This research situated in the Eastern Ghats in south India examines the presence of wildlife in low densities in an anthropogenic landscape. This paper characterizes the landscape matrix in western Chittoor district, Andhra Pradesh based on land-use and cover to assess functional connectivity across four fragmented and unprotected forests. The focus is on the Sloth Bear (*Melursus ursinus*) and the Four-Horned Antelope (*Tetracerus quadricornis*). I employ a mixed methods approach to analyze how this area is used and shaped by humans and wildlife. A land cover map is used to analyze the landscape matrix that consists of dry deciduous and scrub forests, agricultural land and wastelands. Data generated through household surveys across six villages located on the periphery of the unprotected forests explains the everyday practices of the local communities. The results highlight the importance of land use decisions at the household level, social networks and livelihood diversity as key drivers that explain how humans contend with wildlife presence, and unintentionally contribute to wildlife habitat. Analysis of the physical landscape identifies specific land covers that facilitate wildlife movement between forest patches, and reiterates the need for a landscape-centric approach to conservation. The changing livelihood patterns of rural communities suggest that the socio-ecological relationships that mediate production and maintenance of unintended wildlife spaces in anthropogenic landscapes need consideration.

MANAGEMENT AND CONSERVATION OF YELLOW-SPOTTED RIVER TURTLE IN YASUNI NATIONAL PARK ECUADOR

Adrián Naveda-Rodríguez, Wildlife Conservation Society - Ecuador Program; Galo Zapata-Ríos, Wildlife Conservation Society - Ecuador Program; Rubén Cueva, Wildlife Conservation Society - Ecuador Program

The Yellow-spotted River Turtle (*Podocnemis unifilis*) plays key ecological roles in the Amazonian aquatic ecosystem, and has cultural and economic significance for indigenous peoples. The conservation of this species is threatened by water pollution, subsistence hunting, and wildlife trafficking, and as a result, populations have been reduced significantly. Since 2008, Wildlife Conservation Society – Ecuador Program, along with nine indigenous communities, has implemented a management and conservation program of this species in the northern section of Yasuní National Park. Programs activities included headstarting and protection of nesting sites, analyses of movement patterns and population monitoring, and awareness building and education. In 2009, monitoring results showed a relative abundance of 1.2 ind/km. Since 2010 we have released 14666 individuals, and in 2015 we estimated a relative abundance of 5.1 ind/km. Between September 2015 and January 2017, we radiotracked 36 individuals in a 60-km section of the Napo River. Preliminary results show a mean traveled distance of 45.5 km (CI 95%, 33.3-57.6) within a mean linear range size of 17.7 km (CI 95%, 13.7-21.6). Results from the spatial ecology will enable us to understand where we should focus our conservation efforts spatially. Since its beginning, the program has conducted environmental awareness workshops to 797 students from nine indigenous communities; parallel to this, 30 park rangers have been trained in Amazon turtle management and conservation techniques. To ensure the long term financial sustainability of the program, in March 2016 was established a formal "river turtle adoption program" in two indigenous communities, in partnership with two international tourism operators, as a mechanism for generating future funds in support of turtle

conservation. By the end of 2016 1000 Yellow-spotted River Turtle have been symbolic adopted and released through the adoption program.

MANAGING HUMAN-WILDCAT CONFLICT IN COLOMBIA

Carlos Valderrama Vasquez, Panthera & WebConserva

Large wildcats are focal species at the top of the food chain; they are important to maintain ecosystem health by controlling demography of prey species. However, many felids are in global decline, mainly due to the loss of habitats resulting from the expansion of extensive agriculture and indiscriminate deforestation. Additionally, felids come into conflict with humans, especially in areas where native wildlife has been reduced and replaced by livestock. Most cases of livestock predation in Latin America are caused by jaguars (*Panthera onca*) and pumas (*Puma concolor*), generating economic losses and fear within local communities, motivating their persecution and illegal hunting. Three studies were carried out in Colombia to identify the biological and socioeconomic factors that predispose the livestock attacks in order to implement strategies to minimize their occurrence. Two studies were carried out in Casanare and one in Valle del Cauca. A total of 43 farms were characterized and in 19 antipredatory strategies were implemented as pilot ranches to evaluate the effectiveness of the techniques. The strategies implemented included two Sanmartinero cattle paddocks, six-night corrals and 11 paddocks with specially design electrical fencing. All the pilot ranches were monitored using camera traps to identify the carnivore's presence and activity. After the implementation of the strategies only one farm reported one bovine calf depredated by a puma and all recorded carnivores on their premises. The initial results are a good first step to define best practices to minimize the conflict generated by the livestock losses. These studies are part of a broader strategy to raise awareness about the importance of felids in the ecosystems and to develop viable solutions encompassing elements that mitigate the pressure generated by the reduction of habitats and to promote the coexistence and the conservation of carnivore species and improve the production and livelihoods of farmers

MANGROVE ARTISANAL FISHERIES IN THE TROPICAL EASTERN PACIFIC OCEAN

Gustavo Castellanos Galindo, WWF Colombia, Leibniz Centre for Tropical Marine Research; Lotta Kluger, Leibniz Centre for Tropical Marine Research; Matthias Wolff, Leibniz Centre for Tropical Marine Research

Mangroves on the western coast of the American continent account for ca. 10% of the world's mangroves. This isolated marine region is known as the tropical Eastern Pacific (TEP). Despite localized anthropogenic interventions, mangrove ecosystems remain a major source of food and income for people inhabiting the coastal areas of the region. Here, we review the state of knowledge on mangrove artisanal fisheries in the TEP by documenting (1) the principal stocks harvested throughout the region, (2) the calculated economic value of these fisheries, (3) how some of these stocks are currently managed and (4) how the different mangrove social-ecological systems are structured in the region. The most conspicuous mangrove-associated species that are harvested in the TEP are the low trophic level mangrove cockle *Anadara tuberculosa* and the semi-terrestrial mangrove crab *Ucides occidentalis*. In addition, several artisanal fisheries fleets operate in the vicinities of mangroves targeting mangrove-estuarine dependent fish and crustacean species. The value of mangrove fisheries in the TEP has been calculated for a number of sites and ranges from 175 to 37500 US $ ha-1 yr-1. Fisheries management of mangrove-associated resources is often absent or weakly enforced. Many MPAs in the region include mangroves within their limits but their effectiveness remains to be proofed. The most important fisheries (cockles, crabs, and penaeid shrimp) are usually considered over-exploited despite the fact that they remain active and apparently profitable. The structure of mangrove social-ecological systems in the TEP is highly heterogeneous and conditioned by environmental settings, the degree of coastal development, and the countries' dependence on fisheries resources. Given that most mangrove-associated fisheries in the TEP target the same fisheries resources, regional strategies to manage these stocks are required and should factor the heterogeneous character of these systems

MANGROVE ECOSYSTEM AND CARBON STORAGE POTENTIAL IN GUYANA

Abdullah Ansari, University of Guyana

The coastal zones of Guyana are lined by Mangrove ecosystem are dominated by littoral species of trees, shrubs, and ferns that tolerate fluctuation in environmental conditions providing habitat for many species of organisms with important contribution to ecological services to communities across the world. Mangroves are mainly littoral halophytes that survive in condition with varying salinities. Mangroves are very productive in carbon sequestration. There has been no detailed study to estimate the carbon stored in Mangroves in Guyana. This research was carried out with the objective to estimate carbon storage in the three protected species

at study sites located in Berbice (Regions 5 and 6), Demerara (Regions 3 and 4) and Essequibo (Regions 1 and 2) during the period 2014-16. Other physico-chemical parameters soil (bulk density, carbon and nitrogen) of the soil in the mangrove forest in Guyana. The objectives of this research were quantification of aboveground biomass and the respective carbon storage of mangroves species in Guyana, determination the amount of carbon stored in the mangrove soil, prediction of the future carbon storage capacity in mangrove species in Guyana and justification on the importance of conservation and restoration of mangrove forests towards climate mitigation in Guyana. The results from all the regions of Guyana indicate that the two species (*R. mangle* and *A. germinans*) have greater aboveground carbon stock capacity (481 Mg/ha) which can aborb carbon dioxide release from various sources within Guyana. The total forest coverage of Guyana is 18570000 ha containing over 5 gigatonnes of CO2 in aboveground biomass. Mangrove total coverage in Guyana is 22632.4 ha and locked 0.09gt estimated aboveground carbon which is equivalent to 0.257 gigatonnes of CO2. This is significant taking into consideration the low stature, coverage and density of mangroves.

MAPPING THE PATH OF THE BIGGEST FISH: THE WHALE SHARK FROM THE MEXICAN PACIFIC SIDE

Deni Ramirez, Whale Shark México

Monitoring of animal population is critical for proper management. To have a better understanding of the population dynamics and migratory pattern of the whale shark, data is required from locations close to key aggregation sites where hypothesized connections can be validated. The spot pattern of a whale shark is unique to each shark and is an effective marker for capture-mark-recapture studies. Underwater photographs of sharks, combined with photo-comparison software, are used to identify re-sighted sharks, which, in turn, contribute to estimations of population size, age structure, sex ratio, site fidelity, trends in abundance, and movement patterns. Since 2003 we have established and maintained a photographic identification research program in the Gulf of California, and since 2010 at the Archipelago of Revillagigedo (AR). Recently, we add Nayarit (Mexican Pacific) to the study area, and San Luis Gonzaga (Gulf of California) in order to address if connectivity exists in this region. The whale sharks appear to segregate by size. In coastal waters of Los Angeles Bay (LAB), La Paz Bay (LPB), San Luis Gonzaga (SLG) and Nayarit (Na) aggregations are exclusively juvenile sharks (<8 m). In the oceanic waters of Espiritu Santo Island (ESI) and Los Cabos (LC), pregnant adult females (>9 m) aggregate. At AR both pregnant females and juveniles exist but are separated by time. We have identified 898 sharks. Photo-identification showed movements on 133 juvenile sharks between LAB, LPB, SLG and Na and movement of 2 pregnant females between LC and AR. We found high levels of fidelity in the juveniles, for example in LPB up to 61% of the juveniles has been re-sighted between years. In contrast only one pregnant female has been re-sighted at the same locality after 7 years. The connectivity data showed the necessity to generated a regional conservation strategy, from 7 localities were we study these gentle giant 3 are protected, the other 4 needs to have some protection.

MEASURING IMPACTS IN MODERN CONSERVATION NATIONAL GEOGRAPHICS BIG CATS INITIATIVE AS A CASE STUDY

Luke Dollar, National Geographic Society; Jonathan Baillie, National Geographic Society; Colby Bishop, National Geographic Society; Mark Downey, National Geographic Society; Beverly Joubert, National Geographic Society; Dereck Joubert, National Geographic Society; Alex Moen, National Geographic Society; Termeh Rassi, National Geographic Society; Catherine Workman, National Geographic Society

Modern conservation initiatives must quantify their impact and measures of success or failure, particularly in light of expectations of transparency by donors and institutions whose budgetary allocations are subject to tight scrutiny and performance standards. National Geographic's Big Cats Initiative (BCI) was founded in 2009 as a long-term effort to halt the decline of big cats in the wild through 1) Assessment, 2) Protection, and 3) Communication. Since 2010, BCI has provided more than $3.5 M via > 95 field-based conservation grants in 27 countries to more than 50 different projects, grantees, and organizations. Here we present the results of a grantee survey and assessment of performance metrics and results of BCI's direct grantmaking investments toward saving big cats in the wild. Assessment: BCI has underwritten the publication of three major peer-reviewed papers focusing on lion, leopard, and cheetah populations and ranges and contributed to 32 more papers. Protection: Most of the BCI's investments have been driven by the BCI Grants Program. In response to a BCI Impact Survey, Grantees report preventing 2600+ big cat mortalities, including 1275 through fortified livestock enclosures and 1172 through conflict mediations. Respondents report losing 614 big cats to non-natural causes. To date, BCI has sponsored the construction of more than 1600 fortified livestock enclosures, protecting more than 323,000 head of livestock valued at more than $64M. Communication: Nat Geo Wild launched the annual Big Cat Week in 2010,

now reaching over 730 million people globally. The NG Magazine is committed to one big cats feature story per year with many smaller print and digital pieces published throughout the year. BCI reaches over 40 million people on digital and social media channels, which often feature big cat content. The Big Cats Initiative provides a valuable model for ongoing implementation and assessment for modern conservation actions.

MEASURING URBAN BIODIVERSITY: NEW WEB PORTAL TO SUPPORT THE CITY BIODIVERSITY INDEX

Juan De Dios Morales, City Biodiversity Index Coalition

Over 50 cities worldwide have created biodiversity strategies by recognizing the crucial role that urban biodiversity plays in the social, physical, and environmental health of cities, which provides valuable ecosystem services and community-building opportunities. Unfortunately, some cities may lack sufficient resources to effectively execute and evaluate their strategies. In 2008, Parties to the Convention on Biological Diversity recognized the need for a measurement tool for cities' biodiversity efforts. Accordingly, the Government of Singapore's National Parks Board (NParks) coordinated the creation of the City Biodiversity Index (CBI), or Singapore Index, generating a quantitative measure that incorporate three factors: biodiversity assessment, ecosystem services, and governance. Since CBI's launch in 2010, approximately 20 cities have officially used the index to measure their biodiversity. The CBI remains the most robust and comprehensive system for cities to measure their biodiversity strategies. However, it is underutilized and would benefit from additional organizational support. In order to reduce barriers to use the CBI and facilitate measurement of local and global urban biodiversity outcomes, the City Biodiversity Index Coalition was formed in 2016. The CBI Coalition is an international volunteer organization that is partnering with NParks to support the CBI. This year, the CBI Coalition is focused on the development of a one-stop web portal that will bring together urban biodiversity initiatives from around the world and support cities in their application of the CBI. The web portal will facilitate index calculation and data analysis for cities, and will include educational tools and connections to experts for all visitors. This presentation will introduce the web portal and invite attendees to join the CBI Coalition in our goal of linking urban biodiversity efforts and supporting cities with their urban biodiversity strategies.

MIGRATORY INSECTS AND THEIR ECOLOGICAL CONSEQUENCES IN A CHANGING WORLD A REVIEW

Dara Satterfield, Smithsonian Conservation Biology Institute; Sonia Altizer, University of Georgia; Jason Chapman, University of Exeter; Peter Marra, Smithsonian Migratory Bird Center; Scott Sillett, Smithsonian Institution

Many of the world's migratory animals are insects. On annual or multiannual cycles, a conglomeration of species including moths, butterflies, dragonflies, and other taxa undertake migratory journeys. Insect migrations often involve an enormous abundance and biomass of organisms. These insect migrants can be embedded in food webs and provide critical food resources for birds and bats. Further, insect migrants can act as transport vessels or vectors that affect nitrogen and phosphorus transfer, infectious disease dynamics, and pollination. These commonalities suggest important ecological consequences of insect migrations, as has been recognized for other animal migrants that connect diverse ecological communities around the Earth. While insect migrations have received much less attention compared to vertebrate migrations, methods including vertical-looking entomological radar, population genetics, stable isotopes, and citizen science have helped to document insect migrations, to better elucidate their pathways, and to begin to explore how these short-lived, ectothermic invertebrates affect ecological processes. Our understanding of insect migrants' interactions with predators, parasites, propagules, and prey remains limited to a few systems, but the knowledge base is growing. These advances in insect migration biology require synthesis to motivate further study and improve predictions about these innumerable migratory animals that affect food systems, ecosystems, and human health. Here, we synthesize information on (1) the diversity and frequency of insect migration among taxa and which species migrate; (2) how migratory insects participate in food webs, pollination, plant pathogen dispersal, and nutrient transfer; and (3) how migratory insects respond to environmental change. The confluence of the findings we highlight here suggests that migratory insects make up a relatively small proportion of insect species but have a disproportionately large impact.

MODERN TOOLS REVEAL THE IMPORTANCE OF MARSH TO CHINOOK SALMON IN THE FRASER RIVER ESTUARY CANADA

Lia Chalifour, University of Victoria; Julia Baum, University of Victoria; Misty MacDuffee, Raincoast Conservation

Foundation; David Scott, Raincoast Conservation Foundation

The Fraser River runs from the Rocky Mountains to the Pacific Ocean in British Columbia, feeding the largest estuary on Canada's west coast. It supports some of the most abundant salmon runs in the world, which have been declining for decades. The Fraser also supports millions of people, including the city of Vancouver, and is the province's epicenter for shipping, transportation, lumber and coal storage, agricultural land, as well as fishing and recreation. Currently, over 75% of marsh habitat in this working estuary has been permanently altered to support development within the floodplain. The remaining marsh is now threatened by sea level rise, and expanding industrial and urban development. Despite its importance and these ongoing threats, the Fraser River estuary is particularly understudied. In an interdisciplinary study between scientists, an environmental non-profit, and Tsawwassen First Nation, we surveyed salmon and associated fishes at 17 sites across the Fraser River estuary, which encompassed three habitat types: eelgrass, marsh, and sand flat. Using beach and purse seeing methods, we sampled biweekly from March - July 2016. We enumerated and identified all fish to species, measured all salmon, and retained a subsample of Chinook salmon for otolith and genetic analyses. We repeated this sampling twice in the Fall to capture seasonal shifts in fish community structure. We found that salmon preferred marsh habitat throughout the study, and that small "ocean-type" Harrison River Chinook were rearing in these marsh channels for extended periods of time. The Harrison Chinook are a highly-prized subpopulation of white-fleshed, late-run individuals that make up 25 - 30% of the Fraser's entire annual Chinook run. We are using these results to engage in collaborative management between scientists, First Nations, local and federal regulatory bodies, and non-profit organizations to inform habitat management for salmon preservation in the Fraser River estuary.

MOUNTAIN ASH POPULATION DYNAMICS AND THE CONSERVATION OF KEY FOREST HABITAT COMPONENTS IN AUSTRALIA

Brenton Von Takach Dukai, Fenner School of Environment & Society, The Australian National University

Large trees fulfil unique and critical ecological roles in many ecosystems, and have been described as keystone ecological structures. Large trees are declining in ecosystems globally, and their capacity to persist in the face of multiple threats will have major implications for the ecosystems in which they occur. Mountain ash (*Eucalyptus regnans*) is the world's tallest flowering plant, an iconic Australian species that grows to over 100 m tall. Mountain ash dominates the montane wet forests of south-eastern Australia, yet the abundance of ecologically-important hollow-bearing trees, and the persistence of the species itself, are under threat as a result of climate change, logging, and increasingly frequent fires. Mountain ash requires a specific range of fire frequencies and intensities to induce seedfall and aid germination, but, with a rapidly declining interval between wildfires, large areas of immature forest are now at risk of being fire-killed before they develop viable seed crops. Our research investigates this threat to mountain ash, by characterising key parameters relating to maturation and recolonisation ability. We first measured vital rates on young trees and determined which factors were the primary drivers of tree growth and seed production. Then we genotyped hundreds of individuals using both chloroplast microsatellites and next-generation sequencing, to investigate genetic diversity at the landscape scale, and separate the effects of seed dispersal from pollen flow. Our findings show that environmental factors influence the maturation time of mountain ash, leading to likely geographic variation in the species' tolerance of shortening fire intervals. The absence of genetic differentiation over even very large distances indicates high pollen dispersal, but chloroplast DNA data indicate very low seed dispersal and thus limited capacity for recolonization, which is critical for understanding the degree to which the species can tolerate threats in-situ.

MULTIPLE SPATIALLY DISTINCT INTRODUCTIONS IN AN INVASIVE MARINE SPECIES

Eleanor Bors, Woods Hole Oceanographic Institution

Invasive species threaten biodiversity in terrestrial, aquatic, and marine ecosystems, often negatively affecting ecosystem services and damaging economies. Biological invasions are often characterized by a phase of post-establishment expansion in which the invading species increases its range through colonization of new geographic area. Expansions are predicted to result in specific genetic signatures, most notably decreased genetic diversity with distance from the origin of the expansion, which is often the point of introduction for an invasive species. The caridean shrimp, *Palaemon macrodactylus*, is invasive in many regions of the globe, most recently appearing along the US Atlantic coast, with the first report of the species in New York in 2001. Using both mitochondrial cytochrome oxidase I (COI) sequence data as well as data for 1,598 single nucleotide polymorphisms (SNPs) generated through restriction enzyme associated DNA sequencing (RAD-seq), we test two potential

scenarios describing the expansion of *P. macrodactylus* north of New York. The first focuses on range expansion facilitated by ocean currents, physical environment, and life history. The second involves multiple introductions of the shrimp in different estuarine ports. In testing these two scenarios, patterns of population genomic diversity as well as population structure are described. Results do not support a range expansion scenario in which diversity decreases with distance from the point of invasion. Rather, the data suggest a scenario of multiple introductions with diversity increasing with distance from New York, and peaks of mitochondrial diversity in populations collected from New York and the Boston-Plymouth coastline. These results indicate that human-mediated dispersal may be as important—if not more important—than oceanographic and life history considerations during the colonization phases of a marine invasion. This information is crucial for determining appropriate management actions.

NAIRA: A TOOL IN THE MANAGEMENT AND PROCESSING OF CAMERA TRAP IMAGES

Angélica Diaz-Pulido, Instituto de Investigación de Recursos Biológicos Alexander von Humbold; Luis Pulido Castelblanco, SISTEMIC, Engineering Faculty, Universidad de Antioquia, UDEA; Claudia Isaza Narváez, SISTEMIC, Engineering Faculty, Universidad de Antioquia, UDEA

Camera traps are an efficient tool for detecting terrestrial mammals and birds. Vast amounts of presence data and information about distribution and size of mammals and birds have been generated in a very short time using this approach. However, processing times, when done manually, can take longer because of the large amount of data collected. The first step processing the data is to analyze the photographs. The sequences of images captured are complex due to constant changes in the scenes, variation in light levels, and different climatic conditions between triggers and other variations resulting from the natural dynamics of the ecosystem. The manual analysis of camera trap information is time-consuming and as a consequence, conservation oriented strategies based on data are generated slower than the speed of the changes occurring in the study areas. Thus, it is necessary to design new tools that automate the processing of these photographs. Here we introduce a new version of the software NAIRA. This software provides the user with tools for handling large quantities of camera trap images. NAIRA uses computational intelligence techniques to extract metadata, build databases, assist species labeling and automatically classify species captured in images using the photo-trapping technique. The photographs are classified into pictures with animals and without animals using a fuzzy classifier and a second classification distinguishes between birds and mammals using an Artificial Neural Network (ANN). Finally, NAIRA identifies the taxonomic order in the detected mammals using Support Vector Machine (SVM) algorithms. With Naira scientists can process information in less time.

NATURAL REGENERATION ON SEISMIC LINES INFLUENCES MOVEMENT BEHAVIOUR OF WOLVES AND GRIZZLY BEARS

Laura Finnegan, fRI Research; Jerome Cranston, Arctos Ecological Consultants; Julie Duval, fRI Research; Mark Hebblewhite, Wildlife Biology Program; Marco Musiani, University of Calgary; Lalenia Neufeld, Parks Canada; Karine Pigeon, fRI Research; Fiona Schmiegelow, University of Alberta; Gordon Stenhouse, fRI Research

Across the boreal forest of Canada, habitat disturbance negatively affects wildlife, and is the ultimate cause of woodland caribou declines. One of the most pervasive disturbances within caribou ranges in Alberta, Canada are seismic lines that were cleared in the boreal forest during soundwave mapping for oil and gas exploration. Seismic lines facilitate predator movement and may attract predators because they contain early seral vegetation preferred by ungulate prey. Vegetation along seismic lines is slow to regenerate naturally and restoration of seismic lines is a focus of caribou recovery efforts. We used LiDAR data, and multi-species GPS locations to understand how regeneration influenced movement of two caribou predators, wolves and grizzly bears and to prioritize habitat restoration for caribou. Throughout the year, wolves moved preferentially towards seismic lines regardless of vegetation height, and particularly towards wet low-vegetation height (<1.5m) seismic lines. Wolves also moved faster near low-vegetation height seismic lines (<0.7m) during summer. Wet low-vegetation height seismic lines were also preferred by grizzly bears. These results suggest that wolf movements in relation to seismic lines could be influenced by access to areas with higher ungulate prey habitat quality, and that wolves use low-vegetation height seismic lines for travel during summer. For grizzly bears, movements may be governed by access to vegetative food and ungulate prey on or near seismic lines. As results revealed stronger selection of seismic lines by wolves when compared to bears, it is likely that seismic lines primarily benefit wolves. To reduce wolf movement, habitat restoration could focus on seismic lines with vegetation of less than 1m. Because we were unable to identify a vegetation height when wolf movements ceased to be influenced by seismic lines, active restoration tactics such as line blocking could also be required to reduce wolf response to seismic lines.

NEED FOR CONSERVATION PLANNING IN POSTCONFLICT COLOMBIA

Pablo Negret, University of Queensland; Moreno Di Marco, The University of Queensland; Martine Maron, The University of Queensland; Hugh Possingham, The University of Queensland; James Watson, Wildlife Conservation Society

Colombia, one of the most biologically-rich countries on earth with an estimated 10% of global biodiversity within its borders, is emerging from 50 years of internal armed conflict. A final version of a peace agreement between the oldest and strongest Colombian illegal armed group, FARC-EP, and the Colombian government was signed on November 12th, 2016. An important aspect of the peace agreement is rural land reform that aims to encourage displaced people to return to their homes and boost local economies in the less developed, rural regions. This land reform is likely to drive a rapid change in the development of agriculture and extractive industries in regions that were previously inaccessible because of the armed conflict, a phenomenon observed in many countries that have recently emerged from conflict. Without proactive planning, this rural return and its associated development could have catastrophic consequences for its biodiversity. Many of the conflict regions that were beyond the reach of the extractive industry and agricultural development harbor globally-significant levels of biodiversity. Across Colombia, there is a positive relationship between forest cover and the intensity of armed conflict and thousands of square kilometers of highly-biodiverse forested land once under FARC control are now becoming accessible for extractive industries and agricultural expansion. given the nation's globally-significant natural heritage, generating a prioritization plan for conservation initiatives in a post-conflict Colombia is urgently needed. As a preliminary planning exercise, we developed a map of areas of high conservation priority in Colombia and overlapped it with a map of conflict risk. Additionally, we generated another map of conflict risk removing the conflict risk generated by the FARC-EP. Conservation priority areas are determined based on the analysis of these three maps and recommendations for conservation actions based on the findings are given.

NEED FOR SPEED DOES A SLOW LIFE HISTORY LEAD TO HIGH EXTINCTION RISK

Alejandro Laserna, Queens College City University of New York; James Herrera, American Museum of Natural History

We are in the midst of the sixth mass extinction episode in earth's history. Approximately 1208 species of mammals are threatened (22%), 266 of which are primates. Previous work has investigated which traits contribute to the extinction risk of mammals, finding that large body mass and slow life history were linked to extinction threat. There has not been a study focusing on primates and their life history in relation to extinction risk. Primates have an especially high proportion of endangered species (61%). We compiled data from the literature on IUCN Red List status, gestation length, age of first reproduction, body mass, brain size, home range size, and human impacts (composite variable of human population density, road density, and land use) on primates (n=279 species). To test which variables best predict conservation status, we performed multiple regression analyses, controlling for phylogeny. We found that threat status increased with increasing body mass ($r=0.80$, $p<0.01$), longer gestation length ($r=3.38$, $p<0.01$), later age of first reproduction ($r=1.66$, $p=0.02$), larger brain size ($r=0.68$, $p<0.01$) and human impact ($r=1.32$, $p<0.01$), while home range size was not related to conservation status ($r=0.31$, $p=0.2$). Species with longer gestation periods, later age of first reproduction, higher body mass, larger brain size and higher human impact have an increased risk of becoming extinct. Based on our results, species with long gestation length and high human impact that have low conservation status should be re-evaluated and their IUCN Red List status updated. By targeting these species, conservation funds can be allocated to protecting those with higher extinction risk. Similar research should be done for non-mammal species to determine if the same life history patterns present in mammals hold in other taxonomic groups.

NESTING SUCCESS OF WOODLAND BIRDS IN BOX-GUM GRASSY WOODLAND RESTORATION PLANTINGS

Donna Belder, Australian National University

Box-gum grassy woodlands are among Australia's most threatened ecological communities, due largely to land conversion for agriculture. Many bird species associated with these woodlands are suffering population declines due to habitat loss and fragmentation. Restoration plantings aim to increase habitat quality and connectivity for native wildlife in these highly fragmented agricultural landscapes. Our research investigates bird breeding success in box-gum grassy woodland restoration plantings on farms in south-eastern Australia. The primary aim is to assess the habitat quality of plantings for woodland birds. Habitat quality is typically inferred through pattern data, such as species distribution and abundance. However, it is important to consider population dynamics such as breeding success when evaluating habitat quality and assessing whether restoration plantings are meeting

conservation goals. To determine whether restoration plantings provide suitable habitat for supporting resident woodland bird populations, we examined how breeding activity and daily nest success in plantings compared to that in remnant woodland patches, and explored the effects of different planting characteristics (e.g., size and shape) on these variables. We monitored over 250 nests across 21 woodland sites over 2 breeding seasons. Average nest success across all sites was close to the typical rate of around 30%. However, our results indicate much lower success rates and higher incidence of nest predation in remnant woodland sites compared with restoration plantings. Smaller plantings appear to provide the highest quality breeding habitat for woodland birds, with fledging rates four times higher than in similar-sized remnants, and twice as high as in large reference sites. Our findings suggest that restoration plantings have the potential to match and even surpass remnant woodland patches in providing quality habitat for woodland birds in a fragmented box-gum grassy woodland landscape.

NEW ECHOES OF A HISTORICAL MPA: GOVERNANCE AND PERSPECTIVES OF ISLA LOBOS DE TIERRA IN PERU

Daniela Lainez Del Pozo, University College London

Isla Lobos de Tierra is a state-led MPA in Peru that hosts the largest seedbank of Peruvian scallops and protects what once was the most precious resource of the country: guano birds. Being an IUCN Category VI MPA it addresses conservation and sustainable use objectives simultaneously. Many researchers assert the divergence of these objectives is the major challenge to achieve effective MPA governance. This project researches this challenge analysing the understandings of stakeholders about conservation, sustainability and the validity of the MPA, and exploring how their perspectives relate to MPA governance. To this end I collected empirical data and developed a case study of the MPA using ethnographical and participatory rural appraisal methods, as well as complementary analyses of biological data. I found a perceived overall biodiversity decline in the last 3 decades, mainly driven by the onset of scallop trade and neo-liberal economies that brought new idiosyncrasies and extractivist perspectives to play. Given increased fishing pressures and poor law enforcement, predatory activities have expanded without regulation in the MPA. Local users perceive an overall biodiversity decline in the last 3 decades driven by scallop trade. Unsupported by the state and to avoid conflict, traditional fishers migrated to less sustainable fishing techniques or remained silent losing their ancestral stewardship of the island. All stakeholders, including those involved in illegal activities, mention it is necessary to protect the area and highlight they would comply MPA regulations if there was strict surveillance, otherwise: "it does not make sense that we protect resources if there'll be poaching by others". The challenges to achieve the effective management of the MPA are state neglect, corruption, inequality, lack of political will, no sense of belonging and stewardship loss.

NO NET LOSS FOR PEOPLE AND BIODIVERSITY

Victoria Griffiths, Oxford University; Julia Baker, Balfour Beaty; Joseph Bull, University of Copenhagen - KU; E.J. Milner-Gulland, University of Oxford

Governments, businesses and lenders worldwide are adopting a 'No Net Loss' (NNL) objective for biodiversity, which is often partly achieved through biodiversity offsetting as part of a hierarchy of mitigation actions. Offsets aim to balance residual losses of biodiversity caused by development in one location with commensurate gains at another location. While the ecological challenges associated with achieving NNL continue to be debated and explored, the costs and benefits of NNL for local stakeholders have received less attention. International best practice calls for offsets not to make people worse off, but there is a fundamental lack of understanding concerning how to achieve NNL with regard to people's provisioning and cultural values for biodiversity, especially given the inevitable trade-offs when compensating biodiversity losses with gains elsewhere. This is a major challenge for countries where poor people depend directly on natural resources, poorly planned biodiversity offsets can exacerbate poverty, and development impacts can vary by gender and livelihood. We describe an approach for expanding the concept of NNL to include people's provisioning and cultural values associated with biodiversity. We introduce the term 'social NNL', which we define as meaning: affected people at the household level are no worse off in terms of wellbeing than when the development project and associated biodiversity offset started. Building upon this definition, we explore the implications of social NNL, for whom and how it can be achieved. We use a case study in Uganda to illustrate the theoretical and practical challenges of achieving social NNL. These include the spatial redistribution of costs and benefits of the development and offset, and the level at which to measure social NNL i.e., individual, household or village level. We recommend that offset policies should not only aim to achieve NNL of biodiversity but also social NNL.

NOVEL METHODS FOR SPECIES IDENTIFICATION FROM SAMPLES WITH MIXED DNA IN LARGE ECOLOGICAL STUDIES

Shaili Johri, University of Washington; Samuel Wasser, University of Washington

Species identification is a fundamental requirement of wildlife ecology and forensic science. A majority of existing DNA typing methods for species determination focus on single-species DNA sources and are based on PCR amplification using species-specific primers. There are however, many instances where no a priori information about species is available and more than one species are present. For such cases a universal typing method that has potential to detect several species in a mixed source is required. Next generation sequencing methods have met these requirements, however, the significantly high cost and infrastructure requirements, continue to make NGS inaccessible for many researchers. In order to bridge the gap in existing DNA typing methodology, we developed a real-time PCR assay for species identification that is highly sensitive and provides a relatively fast and inexpensive alternative for species identification from mixed sources. The method involves Real Time PCR amplification of mitochondrial loci with high inter-specific variation and, subsequent denaturation of the PCR product to generate High Resolution Melt curves (HRM) that are then used for species identification, by themselves or in combination with other species identification methods. We applied this method to understand the impacts of wolf recovery on distribution, abundance, and resource use of sympatric carnivores in Northeast Washington (NEWA). In order to ensure efficient and comprehensive sampling, we used scat detection dogs to sample seven medium to large carnivores over a 3600 km2 area in NEWA. Dog teams located ~3,900 scat samples over four 5-week sampling sessions. Species identities for these scat samples were then determined using HRM, sequencing and fragment analyses in parallel or in combination. Here we describe the process of method development and results from application of a combination of techniques to the study of a large scale ecological process.

NOWHERE TO GO PERCEIVED BARRIERS TO THE USE OF ASSISTED COLONIZATION FOR CLIMATE SENSITIVE SPECIES

Shannon Rivera, University of Hawaii

The current rate of climate change poses a threat to a substantial portion of species worldwide increasing the need for a range of conservation management strategies. Drastic and timely actions must be taken to counter the additional pressure that will be placed on vulnerable species as the effects of climate change increase. The Hawaiian Islands hold the highest rate of extinction per square mile on earth and predictions indicate that climate change will lead to further declines and extinctions of the more than 400 listed Endangered Hawaiian species making the islands a prime location to impose novel conservation strategies. Assisted colonization, the intentional movement and release of an organism outside its indigenous range, is one management alternative for species that are predicted to lack suitable habitat under likely climate change scenarios. With a focus on cases where such an extreme action may provide a reasonable hedge against extinction, first person interviews with employees of federal, state and non-profit agencies, as well as literature searches were used to evaluate both the perceived and existing obstacles concerning the use of assisted colonization. We found several potential barriers to utilization of this management tool. Assisted Colonization is considered by many to be a high-risk tool, due to the cost of preparing the target habitat, the mortality often experienced by translocated individuals as well as the novelty of this method. Our results suggest that, despite existing policies that allow for assisted colonization in cases where it is warranted, this action is rarely considered. Since assisted colonization is best carried out when populations are robust enough to tolerate the removal of individuals for translocation, we recommend that this management action be considered when planning for the conservation of those endangered species in Hawaii that are projected to have little or no suitable habitat remaining as climate change progresses.

OFFSET COUNTERFACTUALS IN AN UNCERTAIN FUTURE AN IMPACT ASSESSMENTS FRAMEWORK

Isaac Peterson, RMIT; Sarah Bekessy, GPO; Ascelin Gordon, Victoria; Atte Moilanen, University of Helsinki

The mitigation of environmental damage attributed to development through biodiversity offsets is rapidly proliferating, with biodiversity offsets set to play a key role in nature conservation globally. While these policies are designed to compensate for the biodiversity impacts attributed to development, in many circumstances the environmental benefits can fall significantly short of the "no net loss" objective that underpins biodiversity offsetting. The impact assessment of the offset and development sites fundamentally depends on the metric used to define the impact assessment, as well as the baselines (or counterfactuals) the impacts are assessed relative to. The counterfactuals used in formal impact assessments are, in general, estimated rather than known. In particular, it is assumed that the counterfactual captures all significant changes that are likely to occur in the absence of the intervention, for example the changes

attributable to invasive species or climate change. We establish that the current practice of including potential clearing due to development in the counterfactuals used in the offset impact assessment, while omitting these terms in the development impact assessment, is inconsistent and therefore invalidates a no net loss evaluation. We provide a theoretical framework that can be used to quantify the avoided loss gains in the context of biodiversity offsets, proposing an impact assessment relative to a weighted counterfactual that can include a range of counterfactuals for both the development and offset sites. Using this framework, we explore the consequences of a set of assumptions regarding the counterfactuals used in the impact assessments and show that the inclusion of potential clearing due to development and potential offsets in the counterfactuals can lead to the total failure of the impact assessment framework and the invalidation of any subsequent no net loss evaluation.

OIL PALM AS AN EMERGING DRIVER OF DEFORESTATION IN THE PERU IMPLICATIONS FOR BIODIVERSITY

Varsha Vijay, Duke University; Stuart Pimm, Duke University; Chantal Reid, Duke University

Palm oil is one of the most widely traded vegetable oils worldwide, with demand projected to continue increasing. Our previous work has linked the expansion of oil palm plantations with deforestation in South America, especially in Peru where more than half the areas that are currently oil palm were deforested from 2000-2014. In this study, we seek to understand the spatial patterns of deforestation associated with oil palm in Peru and compare this to deforestation for other land uses, including other croplands and tree plantations. Unlike other the types of development we studied, oil palm plantations occur entirely within the tropical moist forest biome. We found that areas being developed for oil palm in Peru differ in many ways from deforestation associated with other types of development. Past agricultural development has occurred generally outside of tropical moist forest biome. What has occurred inside this biome has occurred in different ecoregions than oil palm development. Furthermore, the average patch size of deforestation for oil palm is orders of magnitude larger than for other types of development in the moist forest. We conclude that the emergence of oil palm development could represent a novel threat to the biodiversity of this region. We will discuss conservation priorities in the region in light of our understanding of the spatial patterns of deforestation associated with this threat.

OIL PALM PLANTATIONS AFFECT MOVEMENT BEHAVIOR OF A KEY MIXED-FLOCKING BIRD IN AMAZONIA BRAZIL

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Oil palm (*Elaeis guineensis*) is a rapidly expanding crop in the Amazonian region of Brazil. Brazilian law requires all landowners, including oil palm plantations, to maintain forest reserves and forested riparian corridors as a way to limit biodiversity losses. Because of these laws and the forest-like structure of oil palm, these plantations may function as habitat for some native species in the region. We tested this assumption by experimentally translocating Cinereous Antshrikes (*Thamnomanes caesius*), a forest understory insectivorous bird and nuclear member of mixed-species flocks, from forest reserves to riparian corridors within a large oil palm plantation landscape, and tracked their movements back to their home ranges. In total, we recorded the movements of 18 individuals, eight of which were translocated. The other 10 individuals were tracked within their home ranges in the forest reserves. Six of the eight translocated birds successfully returned to their forest home range, but only one bird flew through the more direct route back through the oil palm matrix while the rest took longer routes through adjoining riparian corridors. Homing time for translocated birds averaged 9.57 (± 2.23 SE) days. The home range of birds within the forest reserves averaged 2.39 (± 0.69 SE) ha, and, with the exception of the single returning bird, Cinereous Antshrikes were never detected in oil palm. Our results suggest that oil palm plantations are a barrier to movements of our study species, and that riparian corridors connecting forest fragments may be effective routes for dispersal.

OVERCOMING THE WALLACEAN SHORTFALL IN COLOMBIA THROUGH COLLABORATIVE MAPPING

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As a megadiverse country, Colombia requires spatially explicit information on the distribution of its biodiversity to advance the conservation and sustainable use of its natural resources and ecosystem services. Currently, information on species distribution is too coarse, not publicly available, out of date or has a low degree of taxonomic coverage, thus being largely ignored by environmental authorities. In order to increase the use of information on biodiversity in environmental decision making and overcoming the Wallacean shortfall, we developed BioModelos, a web application that aims to (1) increase the quality of species occurrence information; (2) incorporate expert opinion in the development of species distribution models; (3) aggregate currently available information on species distributions by facilitating the publication of distribution models and (4) provide species distribution maps, that have been reviewed and approved by experts, freely to any interested user in suitable GIS formats. In its second year of operation, BioModelos has constituted a network of over 200 experts that cover all major taxonomic groups and whom collaboratively improve and fill the gaps in the knowledge of species distributions of Colombia.

PASTORALIST FRESHWATER GOVERNANCE: COMPARING THE WAYUU OF COLOMBIA AND KURIA OF EAST AFRICA

David Robles, Florida International University

Parallels can be drawn between indigenous and pastoralist peoples in different geographic settings, including adaptability, traditional knowledge, and natural resource management. Like many indigenous and pastoral societies, the Colombian Wayuu have undergone pressure to modernize and sedentarize, via different strategies that highlight the uneven power relations between them and external public and private institutions. Wayuu encounters with freshwater development projects tend to be deeply political, pitting local governance against external government forces, with the potential to weaken or strengthen their autonomy and resilience practices. This paper uses a political ecology framework to understand how freshwater resources are understood, conserved, appropriated and negotiated on the water scarce Guajira Peninsula of northern Colombia. To better understand the challenges and opportunities of Wayuu water governance, we compare the Wayuu to the Kuria, an agro-pastoral people of northern Tanzania. The Kuria case provides another perspective from the East African context of the benefits and limitations of pastoralist participation in freshwater resources management. In both settings, human-natural resource relationships have been forcibly changed through land reforms and views on private property that have affected these pastoralist groups during colonialism, nation-state formation and encroachment by industrial, agricultural and conservation enterprises. Based on these two pastoralist societies, our comparative study explores how traditional knowledge can be incorporated into existing methods for freshwater conservation and management, and discusses the necessary efforts and initiative required.

PEACE IS MUCH MORE THAN DOVES: ECONOMIC BENEFITS OF BIRDING TOURISM AS A RESULT OF PEACE IN COLOMBIA

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Colombia has the greatest bird diversity of any country in the world, with approximately 1,900 recorded species, equivalent to 20% of all bird species worldwide. This characteristic highlights the country's great potential for bird-based tourism (bird watching). Advances made by the Colombian government to achieve greater security within the country - putting an end to the long-standing armed conflict - and to promote ecotourism can help position Colombia as one of the most important bird watching destinations worldwide. This study estimates the economic benefits derived from peace in Colombia through the value that members of the US-based National Audubon Society place on a birding tour of Northern Colombia's Caribbean coast. In particular, the study analyzes preferences for a tour that includes the participation of local communities (some of whom were victims of the armed conflict), and visits to areas of importance (due to biodiversity) for bird watching that would offer greater accessibility and safety for visitors after the Peace Agreement is signed. The study also approximates the demand for international bird watching tourism to the country. Through the application of the contingent valuation method, results show that birding enthusiasts would be willing to pay, on average, an additional $60 per day and per person for a tour inside Colombia, as compared to a similar tour in terms of duration and services in Costa Rica, currently one of the main tourism destinations for birdwatchers. Our analysis of demand for bird-based tourism to Colombia indicates that a total of 278,850 American bird watchers would be interested in visiting the country, generating an annual profit of $9 million and 7,516 new jobs. In addition to confirming demand for bird-based travel, the study provides information about potential visitors' preferences, which can help guide the development of a strategy to promote bird-based tourism to Colombia.

PERCEPTION OF ANDEAN BEARS IN A COMMUNITY-BASED CONSERVATION PROJECT IN PERUS TROPICAL ANDES

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Private Conservation Areas (ACP) have been an effective form of conservation in Peru since the category was created in 2001 by the National Service of Natural Protected Areas (SERNANP). Sixteen years ago, the Campesino Community of Corosha started conserving around 2,000 ha of cloud forests and natural high-altitude grasslands, and with them emblematic species such as the yellow-tailed woolly monkey, the Andean night monkey, and Andean bears. With the assistance of a Peruvian NGO, the ACP Hierba Buena Allpayacu was legally recognized in 2011. In 2008 a socio-economic evaluation was carried out on about ~100 families (80% of community) and in 2017 the evaluation was repeated, including a survey of the human–Andean bear conflict. Between the two dates, there were changes in the perception of the forest, the community's environmental and social problems, and their perception of the ACP. 75% of the community was aware of bear attacks on cattle, with an estimate of approximately 15 cattle attacks in the last four years. According to the community, the solution to this conflict is to kill the "livestock-eating" bear (30%), move cattle (11%), and scare the bear (7%). For them, the bear's attacks are because it has lost its habitat (30%), because of aging bears (7%), and the nature of the 'livestock-eating' bears (4%). There is no record of bear conflict related to crop consumption, as there is in other localities. Despite the attacks on livestock, the community sees the presence of bears as positive (79%) because they attract tourism and are a source of pride. In 2016 alone, 96 visitors came to the community, mainly to see the bears. At present, ~15% of the community is involved with either the association of tour guides or the association of lodging and food service. These results show how the creation of the ACP could drive a change of perception regarding forests and their emblematic species, even those that have a complex relationship with humans.

PERFORMANCE OF SATELLITE TELEMETRY IN TERRESTRIAL WILDLIFE RESEARCH WHAT DOES THE EVIDENCE SHOW

Maarten Hofman, University of Göttingen; Niko Balkenhol, University of Göttingen; Matthew Hayward, Bangor University

The performance of satellite telemetry units in terrestrial wildlife research is influenced by many factors: the environmental and topographical conditions of the area in which they are deployed, the characteristics of the species carrying them, unit design and technical specifications, the constellation of satellites for geolocation, the methods and conditions for data transfer, and even the level of species knowledge and telemetry experience of the researchers deploying them. We collated information on elements of most of these factors from 167 projects worldwide, aiming to gain insight in their relative influence on different aspects of their performance. We evaluated the success rate of satellite telemetry units in obtaining fixes and transferring fixes to the user, and evaluated technical failure rates. To avoid literature bias, we used questionnaires to collect data from over 3000 units, deployed on 63 species in 143 study areas worldwide. We used boosted beta-regression to model the units' performance as a function of a set of variables representing species and environment characteristics, deployment settings, and unit specifications. We found that average fix success and data transfer rates were high, and that species characteristics and unit specifications were generally more important than qualitative or quantitative measures of environmental characteristics in determining the success rates. However, on average, close to half of the unit deployments ended prematurely, and about 25% suffered a technical failure. Despite the challenges involved in satellite telemetry, the detail, amount, and quality of data often exceeds that of data gathered using traditional VHF telemetry or camera trap grids. Nevertheless, researchers and conservationists should thoroughly consider the need for satellite telemetry to answer their specific research questions, given the sizeable investments involved for a scientifically sound and statistically robust result.

PHENOLOGICAL SHIFTS PROVIDE A MECHANISM FOR THERMAL NICHE TRACKING OVER A CENTURY

Jacob Socolar, University of Connecticut; Morgan Tingley, University of Connecticut; Steven Beissinger, U.C. Berkeley; Peter Epanchin, U.S. Agency for International Development

Species are expected to adjust their geographic ranges over time in order to track shifting temperatures under climate change. Although the mechanisms underlying these range shifts are poorly known, global congruence of moving species with changing temperatures supports the hypothesis. Phenological advancement is largely seen as an independent effect of climate change, where consumers – such as birds – respond phenologically to earlier resource availability rather than climate per se.

Phenological advancement of breeding times, however, exposes adults and young to cooler spring temperatures in temperate regions, which could serve as an additional thermal buffer to global warming. Here we use a novel formulation of a community occupancy model to estimate the magnitude of breeding phenological shifts across an entire community of Californian birds over a period of a century. The data support an average phenological advancement of 5-12 days during this period, which lowers average temperatures experienced by breeding birds and their ectothermic young by over 1°C. Additional analyses of a continental dataset of breeding records show that across North American birds, warm June temperature anomalies are associated with high nest success in the cold parts of a bird's range but low success in the warm parts of its range. We propose phenological shifts as an overlooked mechanism for thermal niche tracking, with the potential to reshape both the need and opportunity to shift geographically.

PLANNING FOR RECOVERY: OPENS STANDARDS AND THE FUTURE FOR THE SAN CLEMENTE LOGGERHEAD SHRIKE

Andrew Bridges, Institute for Wildlife Studies; Melissa Booker, US Navy; Nicole Desnoyers, Institute for Wildlife Studies; Susan Farabaugh, San Diego Zoo Global; David Garcelon, Institute for Wildlife Studies; Kim O'Connor, US Navy; Quinn Shurtliff, Wastren Advantage Inc.; Justyn Stahl, Institute for Wildlife Studies; Sandy Vissman, US Fish and Wildlife Service

Conservation biologists have long needed a methodical, standardized, and robust system for designing, assessing, and communicating the effectiveness of their efforts. In response, the Conservation Measures Partnership developed the Open Standards for the Practice of Conservation. This system incorporates interdisciplinary theories and principles of adaptive management to produce a conservation planning and evaluation process broadly applicable across temporal, geographic, and programmatic scales. In the early 1990's, <20 San Clemente loggerhead shrikes (*Lanius ludovicianus mearnsi*) existed in the wild. In an effort to save species, the U.S. Navy has conducted an intensive recovery program including invasive predator management, captive breeding and releases, supplemental feeding, and habitat enhancement. From 2014–2017, we used the Open Standards to evaluate and redefine our recovery program. While this process generally is applied in earlier planning phases and to broader bioregions, we applied it to a well-established, long-term, mono-specific program. We found that it allowed us to capture institutional knowledge, evaluate implementation efficacy, and reveal the team's tacit but sometimes conflicting assumptions. Despite our program's long history, the process yielded surprising insights including identifying previously unidentified ecosystem drivers, misplaced management emphases, and new solutions to our conservation challenges. Our resultant approach is more interdisciplinary and based on better informed and empowered stakeholder groups with clearly defined, mutually agreed upon, and codified goals. The results of this process now form the foundation of our recovery program, and provide a much-needed road map for future recovery efforts. We recommend conservation biologists consider this powerful approach for formal planning and ongoing adaptive management – regardless of project scope or phase.

POPULATION MODELING OF ASIAN ELEPHANT IN A TROPICAL FOREST OF NORTH EAST INDIA

Jyoti Das, Aaranyak

Reportedly, in Manas National Park the elephant population ranged from 500 – 900 over the years based on non-systematic direct count. Given the importance of Manas as a potential elephant conservation area in the eastern Himalayan landscape; there is a critical need for accurate elephant population estimation. Therefore, ecological density of elephant was estimated using line transect and dung decay rate method in the tropical forest of Manas. Spatial transects ranging from 0.8-1.3 km (n=92) were laid in a stratified random manner in a (1 X 1) km grid map across the study site during 2014-15. A total of 100.65 km was walked during the survey across two seasons- dry (Oct – Apr) and wet season (May – Sept) in three major vegetation types. Our result showed the presence of 601 elephants (CV-14.22 %, 95% CI: 454-797) with a density of 1.33 per km2 (CV=14.22 %, 95% CI: 1.01-1.77) in the Park using program Distance v6.2. The density was highest in mixed moist deciduous forest (1.57 ± 0.25 elephants per km2) followed by density in the grasslands (1.30 ± 0.18 elephants per km2). This will serve as new baseline data for Asian elephant population in the Park. We further focus on the efficacy of the method in tropical forests across Asia.

POPULATION RICHNESS OF VERTEBRATE SPECIES ACROSS THE AMERICAS

Elizabeth Lawrence, Concordia University

The significance of population and genetic diversity is of growing interest for biodiversity conservation but often remains absent from large-scale conservation planning. This study overlays and compares three levels of biodiversity in vertebrates across North, Central, and South America – genetic, population, and species

richness – to assess latitudinal and continental patterns. We have established a database containing population-specific genetic data from published nuclear DNA microsatellite studies on more than 500 species and ~10,000 distinct populations of mammals, freshwater and anadromous fish, amphibians and reptiles, totaling ~400,000 genotyped individuals. Preliminarily, we find a geographic mismatch between richness at all three levels of biodiversity, revealing population/genetic 'hotspots' not previously detected at the species level. Our results suggest that the processes leading to the extent of population diversification may be different from those driving species richness. Our study provides a novel look at biodiversity in considering multiple levels below species and provides new insight for global biodiversity conservation initiatives.

POST-FIRE RECOVERY OF A NATIVE RODENT: MANAGING FIRE FOR CONSERVATION IN NORTHERN AUSTRALIA

Robyn Shaw, The Australian National University; Sam Banks, The Australian National University; Alex James, The Australian Wildlife Conservancy; Rod Peakall, The Australian National University; Katherine Tuft, Arid Recovery

Since the arrival of Europeans in Australia, the continent has suffered the most severe declines of native mammals of anywhere in the world. Northern Australia, far less developed than the south, has long been considered a haven for wildlife. However, the mammals of this vast region have declined drastically in recent decades. Evidence suggests that the prevailing regime of frequent, intense wildfires late in the dry-season may be a key factor contributing to these declines. For this reason, conservation-based fire management focuses on implementing low-intensity burns early in the dry-season, creating a mosaic of burnt and unburnt habitat to prevent late-season wildfires. In order to design effective fire management strategies for conservation, we need to understand the mechanisms by which populations recover after fire. We assessed the immediate response to fire of a vulnerable native Australian rodent, the pale field-rat (*Rattus tunneyi*) and investigated how populations recover after fires of varying intensity and size. We carried out fire experiments in the Kimberley region of Western Australia, using 'patchy' and 'thorough' burns to represent early- and late-dry-season fires. We collected mark-recapture data, genotypes and vegetation structure measurements before fire and during the post-fire recovery phase over a one-year period. We found that vegetative cover and pale field-rat captures decreased after fire. This was much more dramatic after 'thorough' burns than after 'patchy' burns. One year after fire, both vegetation and pale field-rat populations recovered quickly. However, the mechanisms of population recovery differed between fire types, with recovery driven by in situ survival after 'patchy' fires, compared to recolonisation after 'thorough' fires. Understanding this process is vital for designing fire management strategies that support the recovery of vulnerable native rodents, as well as other mammals declining across similar habitats.

POTENTIAL HUMAN HEALTH BENEFITS FROM ERADICATION OF INTRODUCED CATS ON ISLANDS

Luz de Wit, University of California Santa Cruz; Donald Croll, University of California Santa Cruz; Bernie Tershy, University of California Santa Cruz

Cats (*Felis catus*) have been introduced to approximately 560 inhabited islands that harbor IUCN-listed endangered and critically endangered species. Introduced cats are a major threat to seabird colonies and island endemic species, and may also be important sources of pathogens that affect humans such as Toxoplasma gondii. *T. gondii* can cause miscarriages, severe ocular and neurological lesions in newborns, systemic disease in immunocompromised people, and is associated to psychiatric diseases. Islands provide an ideal setting to control or potentially eliminate local sources of *T. gondii* through cat population control or eradication because cats are the sole reservoirs of the parasite in the majority of islands worldwide. To assess if cat eradication potentially reduces probability of exposure to *T. gondii*, we compared the burden of *T. gondii* infection in people from Natividad Island (Mexico), where cats were eradicated in 2000, to the neighboring island Cedros. We obtained blood samples from inhabitants of different age classes to estimate the proportion of people with antibodies against *T. gondii* (seroprevalence). The overall seroprevalence of *T. gondii* infection was significantly lower in Natividad (2.13%) compared to Cedros (13.5%) ($p < 0.001$). Age-specific seroprevalence was also significantly lower in Natividad for children born after cat eradication. Our results suggest that feral cats may be an important source of *T. gondii* exposure in these two Mexican islands, and that cat eradication may be acting as a protective agent against local exposure in Natividad. Our study highlights the potential for management of invasive species as a means to benefit human health, while also mitigating biodiversity loss.

POTENTIAL IMPACT OF RIVER DIVERSIONS ON WETLAND INUNDATION AND WATERBIRD COMMUNITIES

Justin McCann, University of New South Wales; Richard Kingsford, University of New South Wales; Rachel Melrose, University of New South Wales; Gordana Popovic, University of New South Wales

The Paroo and Warrego River catchments of the Murray-Darling Basin in Australia are amongst the few systems globally that remain largely intact and protected from water resource developments, with flow variability in the Paroo River protected by an intergovernmental agreement. Protection of inflows from the Warrego and Paroo Rivers is critical for maintaining the function and biodiversity of one of the more important wetland sites in the Murray-Darling Basin, Yantabulla Swamp (31,000 ha) which is not formally protected. Licences, currently not activated, exist to extract water upstream. Activation of these licenses would divert river flows, compounding the effects of climate change on the flooding and ecology of this semi-arid wetland. To investigate the potential impacts of the water diversion licenses, we modelled the impacts of river diversions and climate change on inundation regimes and waterbird communities of Yantabulla Swamp. We used remotely sensed imagery to determine inundation extent over time and related this to river flow and rainfall. We used aerial waterbird survey data for the wetland (1987-1990; 2008-2015) to relate inundation with waterbird numbers. Our results show that river diversions will reduce flood durations but are unlikely to significantly affect current flooding frequencies. Reductions in flood duration may affect breeding of some waterbird species and reduce the viability of the area as an important site for maintaining waterbird communities.

POVERTY AND LOW PREFERENCE DRIVES THE CONSUMPTION OF PROTECTED SPECIES IN MADAGASCAR

Samuel Merson, University of Oxford; Luke Dollar, National Geographic Society; Paul Johnson, University of Oxford; David Macdonald, Univ of Oxford

Madagascar is a biodiversity hotspot and one of the world's greatest conservation priorities. During the last decade bushmeat consumption is increasingly acknowledged as one of the major threats to Madagascar's vertebrates. Nevertheless, few studies have examined its drivers, and no studies have examined its variance across Madagascar's forests and protected areas. This research provides the first inter-forest (deciduous and rainforest), and inter-protected (National Park, Reserve, Unprotected) study of bushmeat consumption. 1750 households were interviewed across four regions, including, two national parks, two reserves, and two unprotected forests. Our results revealed poorer households were significantly more likely to consume greater quantities of protected species. Conversely unprotected species were consumed by wealthier households, and in greater quantities. Protected areas did not appear to reduce consumption of protected species, with households located inside Mantadia-Andasibe National Park, Madagascar's most visited protected area, consuming greater quantities of protected species. These results reflect interviewees' stated preference for favouring consumption of domestic animals. Unlisted, pest and game species were the most favoured wild animals, with lemurs and carnivores the least favoured. Our results suggest that the high preference for domestic and unprotected species has potentially created a price barrier for poorer households. Given the lack of preference for most protected species, future efforts to reduce their consumption should focus on improving accessibility and reducing the cost of domestic animals in Madagascar's rural areas.

POWERSENSOR! A POWER ANALYSIS TOOL FOR OCCUPANCY MONITORING PROGRAMS

Jorge Ahumada, Conservation International; Lydia Beaudrot, University of Michigan; Patrick Jansen, Smithsonian Tropical Research Institute/Wageningen University; Tim O'Brien, Wildlife Conservation Society

Identifying changes in species distributions and abundances is essential for conservation science and management. Many monitoring programs use occupancy estimated from repeated sampling as a proxy for population abundance, and use dynamic occupancy models to detect species trends. However, sampling designs underlying such programs are rarely based on prior sensitivity analysis due to a lack of accessible tools. Here, we describe PowerSensor!, an app to assess the sensitivity of alternative sampling designs for detecting changes in occupancy over time. The app uses simulated occupancy data for designs with varying numbers of sampling points and sampling durations for populations with different initial occupancies, detection probabilities, and occupancy changes, and calculates sensitivity as the number of survey seasons of sampling required until a known change is first detected. We tested the performance of the app using simulations, which yielded sensible results. Occupancy changes could be detected in fewer years when declines were greater and when more sampling points were used. Higher initial occupancy and detection probabilities increased the likelihood of detecting declines and decreased the number of sampling seasons necessary to detect change. The optimal sampling

design for detecting occupancy changes depends on goals of the specific monitoring and research program under consideration, and the properties of the target populations. PowerSensor! allows researchers to easily determine which survey design will work best to achieve their goals, and predict the number of seasons of sampling required to detect occupancy changes. The application can also be used for training and education purposes.

PREDICTABILITY OF INTRODUCED SPECIES ESTABLISHMENT

Gian Marco Palamara, University of Zürich

Invasive species are a serious threat to biodiversity worldwide and predicting whether an introduced species will first establish and then become invasive can be useful to preserve ecosystem services. Establishment is influenced by multiple factors, such as the interactions between the introduced individuals and the resident community, and demographic and environmental stochasticity. Field observations are often incomplete or biased. This, together with an imperfect knowledge of the ecological traits of the introduced species, makes the prediction of establishment challenging. Methods that consider the combined effects of these factors on our ability to predict the establishment of an introduced species are currently lacking. We develop an inference framework to assess the combined effects of demographic stochasticity and parameter uncertainty on our ability to predict the probability of establishment following the introduction of a small number of individuals. We find that even moderate levels of demographic stochasticity influence both the probability of establishment, and, crucially, our ability to correctly predict that probability. We also find that estimation of the demographic parameters of an introduced species is fundamental to obtain precise estimates of the interaction parameters. For typical values of demographic stochasticity, the drop in our ability to predict an establishment can be 30% when having priors on the demographic parameters compared to having their accurate values. The results from our study illustrate how demographic stochasticity may bias the prediction of the probability of establishment. Our method can be applied to estimate probability of establishment of introduced species in field scenarios, where time series data and prior information on the demographic traits of the introduced species are available.

PREDICTING ATTACKS OF ELEPHANTS AND CARNIVORES ON AFRICAN FARMS

Jens Jung, SLU

In Africa, the conflict between wildlife and farming is a widely addressed subject. In this study we focus on the impacts of elephants, hyenas and lions on local farms. One of these species is an herbivore and the other two are carnivores, but the problems are similar. They can raid farms for crops or livestock, and they may even kill people. To prevent or retail this, local farmers may kill elephants or predators. Poaching elephants for ivory is a well-known problem; killing elephants due conflict with farmers may in the long run be at least as important. Ol Pejeta Conservancy in Central Kenya is a large reserve that keeps about 6000 heads of cattle but also hosts hundreds of large carnivores, such as lions and hyenas. About 70 heads of cattle are killed every year within the reserve, which is affordable as the farm has income from tourism. The situation for the farmers outside is different; losing a cow or parts of a cornfield may be an economic catastrophe for a local smallholder. The size of Ol Pejeta is approx. 400 square km and it is fenced all around, but there are three corridors that allow the elephants and carnivores to move freely in and out. With the use of 10 camera traps in these corridors we have recorded about 10 000 individual passages of our three focal species. We recorded the exact time and day to analyze these data with other parameters such as season (dry/wet), weather (rainfall, temperature), and moon phase. All these factors were used when analyzing how many of our focal animals move and if they move in or out of the reserve. We have found clear patterns that help us to predict when these potentially dangerous animals will move out of the reserve and may pose a threat to local farmers outside. This may be used to introduce a system that warns the farmers when to be extra alert to guard their fields and livestock. By preventing damage, we hope to reduce the conflict with wildlife and hence prevent killings of both livestock and wildlife.

PREDICTING POPULATION DENSITY IN TERRESTRIAL VERTEBRATES FOR CONSERVATION APPLICATIONS

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While the effects of life history traits on population density have been widely investigated both at local and macro-ecological scales for specific organisms, how spatial environmental variation influences population density for a large range of organisms and at broad spatial scale is poorly known. This gap of knowledge is

critical for global species management and conservation planning and to understand the potential impact of environmental changes on multiple species. In this study we built on a large (~15,000 record) global dataset of density estimates of terrestrial amphibians, reptiles, birds and mammals to investigate how density varies globally with respect to life history traits and environmental factors. We tested different hypotheses to explain the variation in population density for the four groups, and further assessed models' predictive accuracy by means of cross-validation. Species traits, resource availability and climatic stability have a different influence on the four groups. While traits determined most of the variation in population density, environmental conditions explained the intra-specific variation across populations. Amphibians were more abundant in productive and wet areas, while reptiles show relatively higher densities in arid areas with low productivity and stable temperatures. Density of birds and mammals was typically high in temperate wet areas with intermediate productivity. The models showed good predictive abilities and can be further used to inform species assessments, conservation planning and contribute to forecasting biodiversity responses to climate change. Our research considerably improves our understanding of abundance distribution in terrestrial vertebrates at a global scale, and set the basis for a better inclusion of population density in large-scale and multi-species analyses.

PREDICTING ROAD MORTALITY HOTSPOTS IN NORTHEASTERN NORTH CAROLINA, USA

Christine Proctor, Harrisburg University; Marcella Kelly, Dept of Fisheries and Wildlife; Andrew Trent, Virginia Tech; Michael Vaughan, Virginia Tech

Vehicular collisions have now surpassed hunting as the leading direct human cause of vertebrate mortality on land. While the number of common species killed along roads is staggering, population effects can be devastating for small and declining populations. In response, many local, state, and federal agencies are incorporating mitigating structures into highway design to reduce the occurrence of wildlife-vehicle collisions. Past studies have found that road kill locations act as reliable indicators of wildlife crossing areas. We conducted road kill surveys along a 19 km stretch of US 64 running through the northern portion of Alligator River National Wildlife Refuge in Dare County, North Carolina. Road killed animals were collected and identified by walking along the highway every 7 – 10 days during summer months (April – August) and every 14 days in all other months (September – March) from March 2009 to March 2011. Every vertebrate animal mortality was identified to as precise a taxonomic level as possible. We also recorded UTM coordinates, date, sex, and age. All road kills were removed from the search area to avoid double counts in subsequent surveys. In a GIS, kernel densities were used to determine road kill hotspots for the complete data set and for each taxonomic group. Negative binomial generalized additive models were then used to determine which variables best explained the location of road kill hotspots along the highway. The most parsimonious model included species and month as predictor variables. When broken down by taxonomic group, month and sex best explained the location of reptile road kills while month and habitat best explained the location of both amphibian and avian road kills. These results were used to guide the placement of mitigating structures for a planned road project and identify landscape features that will increase the success of such structures.

PRIORITIZING CONNECTIVITY TO FACILITATE RANGE SHIFTS: A NEW CONSERVATION SCIENCE CHALLENGE

Annika Keeley, UC Berkeley; Patrick Huber, UC Davis; Adina Merenlender, UC Berkeley

While habitat connectivity research is several decades old, prioritizing landscape connectivity to facilitate range shifts in response to climate change is a new conservation challenge. We systematically reviewed the literature on modeling approaches that integrate connectivity and climate change science to analyze the emerging solutions. We identified 61 original studies and 28 essays and reviews published between 2005 and 2017. Approaches include linking protected areas, geomorphic features such as land facets, or desirable atmospheric conditions. Spatial models incorporate factors such as human land use, degree of naturalness, environmental gradients, climate velocity, current and future habitat suitability, dispersal ability and climatic hold-outs. To detect major pathways along which species ranges will shift in response to climate change, some studies (N=7) modeled current and predicted ranges of hundreds of species based on climatic preferences. Others avoided species specific approaches and/or future climate predictions to reduce uncertainty, but relied on geomorphic features, environmental gradients, or naturalness alone (N=11). Numerous papers (N=17) assessed connectivity using current and predicted species distribution models (SDMs) for select focal species, while others (N=11) assessed connectivity for focal species without applying SDMs. Few studies were more biologically informed, relying on detailed species information on dispersal, vegetation, and observed responses to the built environment (N=3). A surprisingly large number of methods (N=22) have been developed to map linkages; those that stem from least cost path

analyses were employed most frequently. With only 6 papers using more than one method, little information is available to compare the effect of different methods on linkage delineation and prioritization. Advantages and disadvantages of existing approaches for connectivity climate science and practice will be discussed.

PRIORITIZING MANAGEMENT ACTIONS WHEN DATA IS SCARCE AND SYSTEMS ARE COMPLEX

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Conservation research has predominantly focused on identifying where and why species or habitats are under threat. While this is a crucial first step, it does not tell us how to optimize the allocation of resources in order to conserve threatened biodiversity. The time is ripe to focus on identifying the key management actions needed to respond to multiple threats and emerging risks. Using state-of-the-art techniques in conservation decision science, priority threat management assessment, and expert elicitation, we identify the most ecologically effective and at the same time, least costly management actions needed to ensure the long-term persistence of at risk biodiversity of the Fraser River Estuary. This estuary is the mouth of the largest salmon bearing river in the world and a stopover point for more than one million migratory birds. Many species on the estuary are threatened by water pollution and loss of habitat resulting from industrial and urban development, exploitation of fish stocks, and climate change. This study region serves as a prime example of a complex system under siege from multiple threats but with limited scientific data. We show that such systems can be analyzed to generate management actions ranked according to estimated cost, ecological benefits, the probability of success, and co-benefits including job creation and carbon sequestration. Importantly, this analysis can clarify what can and cannot be achieved for different levels of conservation investment, and can be used to leverage increased investment in conservation management.

PRIORITIZING TIDAL WETLAND CONSERVATION IN AN AGE OF SEA LEVEL RISE

Nava Tabak, Scenic Hudson

The Hudson River Estuary (northeastern USA) hosts 2,800 hectares of predominantly freshwater tidal wetlands which are located along its length in nearly 50 distinct wetland systems. The region is experiencing relatively rapid rate of Sea Level Rise (SLR), but models project considerable potential for these wetlands to adapt, particularly through horizontal movement into adjacent undeveloped areas. Conservation practitioners are challenged with appropriating limited land protection and restoration resources across the tidal wetland systems of the estuary. I used two conservation metrics along with land parcel information to create prioritization schemes that inform conservation planning for these vital ecological resources. The Wetland Pathway metric was defined as combination of projected wetland extent by year 2100 under a range of SLR and accretion scenarios, and Wetland Vulnerability as the level of agreement on projected wetland loss to inundation among the modeled scenarios. An analysis of unprotected parcels found that fewer than 3% of them encompass over 50% of the unprotected Wetland Pathway. Nine wetland systems were prioritized for concerted land protection efforts based on having 5 or more of these parcels that total at least 25 ha of the Wetland Pathway. Rankings based on Wetland Vulnerability identified a set of 6 wetland systems that collectively encompass ca. 45% of the total potential wetland loss in the estuary; 3 of these systems are almost entirely conserved and represent candidates for hosting research and actions to promote wetland adaptation. These conservation metrics can be applied to other coastal resource conservation efforts where there is a range of future projected responses to SLR, and more broadly as a conservation planning framework where distinct conservation units must be prioritized to increase regional resilience to climate change.

PROGRAM MANAGEMENT SUCCESSES AND FAILURES - LESSONS FROM A DONOR PERSPECTIVE

Karolyn Upham, USAID; Karl Wurster, USAID

Bilateral and multilateral donor agencies contribute hundreds of millions of dollars to biodiversity conservation. Each year, the U.S. government contributes approximately $250 million to international biodiversity conservation efforts. The U.S. Agency for International Development (USAID) is the main agency responsible for these resources, funding a wide variety of conservation projects in developing countries throughout the world. Projects range from grants of less than $100,000 to large national and/or regional projects of over $50,000,000. These projects are implemented by a range of conservation partners, including small NGOs, large international NGOs, private development companies, intergovernmental organizations, and partner government agencies. This presentation is a compilation of program management successes and failures collected by USAID environment officers. It will highlight common, or not so common, practices that help design and manage successful natural resource

management and conservation projects. The presentation will also discuss donor and field partner project management failures and propose ways to learn from these failures in order to improve project management and conservation impact.

PUBLIC UNDERSTANDING OF HYBRIDIZATION, CONSERVATION, AND THE ROLE OF WILDLIFE TOURISM

Catherine Macdonald, Abess Center for Ecosystem Science and Policy

As global climate changes, the ranges of polar bears (*Ursus maritimus*) and grizzly bears (*Ursus arctis horribilis*) increasingly overlap, and evidence suggests that hybrids of these species already exist in the wild. There is growing concern that polar bears, which are well adapted for an arctic habitat that is rapidly disappearing, may prove incapable of surviving the impacts of anthropogenic climate change—and concurrent questions about whether hybridization with grizzly and brown bears may represent an adaptive response which preserves polar bear genes. Our understanding of public perceptions of hybridization and the implications this may have for policy support and interest in potential conservation tools such as tourism is lacking. This survey-based research explores public perceptions of hybridization and non-expert intuitions about the relative importance of biological and social factors in categorizing species, as well as in valuing and protecting wildlife. It also addresses questions about wildlife tourism, including public perceptions of tourism as helpful or harmful to wildlife and the degree to which hybrids have the potential to attract equivalent tourist interest as parent species. This has important conservation implications, as tourism is playing an increasingly important role in conservation funding and planning, and wildlife conservation action typically targets by species. However, our findings suggest the possibility that the concept is understood profoundly differently by the general public than by scientists and conservation professionals.

PUBLICATION RATES AND PRESENTER DEMOGRAPHICS AT THE 25TH ICCB (AUCKLAND 2011)

Luis Verde Arregoitia, Universidad Austral de Chile

Every two years, conservation professionals, researchers, and students from around the world come together at The Society for Conservation Biology's International Congress for Conservation Biology (ICCB). ICCBs are an important venue for presenting new research and developments in conservation science and practice. This work summarizes a data-driven exploration of conference contributions from the 25th ICCB held in Auckland, New Zealand in 2011. Titles, number of authors, lead author affiliations, gender, country of study region, publication status, and the elapsed time between presentation and publication were collected to study publication trends and presenter demographics. Of the 980 contributions (782 talks and 198 posters), 579 (59%) became scientific publications, with a median time to publication of 34 months. The gender breakdown of presenters was almost even (53% male, 47% female), but the representation of the countries where the presenting authors were based at was biased. Out of 73 political units represented in the meeting, those with the most contributions were by far the USA, Australia, New Zealand, and the UK. Presenters based in countries with English as official language represented 74% of the total sample, but this did not seem to affect the likelihood of their contribution becoming a publication. This type of analysis can help increase speaker diversity and publication rates in order to make conference communications permanent and increase their reach beyond those in attendance.

PUTTING CONNECTIVITY SCIENCE INTO PRACTICE FOR CLIMATE RESILIENT LANDSCAPES

Adina Merenlender, Hopland Res & Ext Ctr; Nicole Heller, Peninsula Open Space Trust; Annika Keeley, UC Berkeley

Habitat corridors have been a go to solution for sustaining life in fragmented landscapes since the mid-1980's and now are a widely recognized climate adaptation strategy. Since then, significant advances have been made in habitat connectivity analysis and planning. However, a literature review reveals only a handful of publications about corridor implementation. To research the conservation challenge of putting connectivity science into practice, we interviewed 30 practitioners working across disciplines on implementing habitat connectivity projects; and held a two-day workshop to explore opportunities and barriers to implementation. Data on real world corridor projects reveal disconnects between connectivity science and practice; such as a research focus on individual species connectivity modeling as compared to an emphasis on entire ecosystems that most corridor projects need to address. Also, only one third of those interviewed included aspects of climate adaptation in planning their corridor projects. Challenges practitioners face included a lack of data for locating the best corridor sites, short project time-lines, and a lack of regulations requiring the protection of habitat connectivity. Those who were successful noted the importance of close collaboration with scientists, were motivated to comply with regulations

or required mitigation, and garnered public enthusiasm for the project. Wildlife friendly fencing, road under- and overpass construction, habitat restoration, and conservation easements were tools used to improve habitat connectivity; but to address climate adaptation requires a larger landscape approach and new policy instruments to facilitate long-term species range shifts. We discuss necessary improvements to climate-wise connectivity planning as part of a framework to improve implementation on the ground.

QUANTIFYING AND MAPPING ILLEGAL POISON USE BY FARMERS IN NAMIBIA

Andrea Santangeli, University of Helsinki; Volen Arkumarev, BSPB; Marco Girardello, University of Aarhus; Niki Rust, San Diego Zoo Global

Effective nature conservation in human-dominated landscapes requires a deep understanding of human behaviors, perceptions and values. Human-wildlife conflicts represent relatively well-studied, global-scale conservation challenges. In Africa, vulture populations are collapsing as they fall victim to poison used by livestock farmers to kill predators, but our understanding of the prevalence of this practice is still very poor. We gathered data on the prevalence of poison use in Namibia by means of questionnaires completed by commercial farmers. The data were collected and analyzed with ad-hoc quantitative methods. We quantified prevalence of poison use, determined factors associated with this practice and derived a map of its prevalence. We found that 20% of commercial farmers in Namibia used poison; farmers that owned high numbers of small stock and on large farms, and those who had suffered high livestock losses to predators, were most likely to admit to using poison. We pinpoint areas of high prevalence of reported poison use, which are largely concentrated in the south of the country. Furthermore, we report a generally positive perception of commercial farmers towards vultures, which may indicate future potential to implement bottom-up approaches for vulture conservation. Overall, the findings have important implications for prioritizing efforts to effectively tackle the African vulture crisis and preserve healthy ecosystems for the wellbeing of humans and wildlife.

QUANTIFYING HUNTING-INDUCED DEFAUNATION ACROSS THE TROPICS

Ana Benítez López, Radboud University; Mark Huijbregts, Radboud University; Aafke Schipper, Netherlands Environmental Assessment Agency, PBL

Defaunation in the tropics is primarily driven by overhunting. However, the impact of hunting on wildlife populations has not yet been systematically quantified at the pantropical scale. We synthesized 176 studies to quantify hunting-induced declines of mammal and bird populations across the tropics. We also developed meta-regression models linking hunting-induced changes in animal abundance to several anthropogenic drivers of hunting, while controlling for resource availability (NPP) and species traits (body mass and guild). The drivers included were the proximity to hunter's access points (roads, settlements), accessibility to urban markets (travel time to major towns), region, human population density, type of hunting (commercial vs subsistence), protected area status, food security (livestock density) and poverty levels (prevalence of child malnutrition, infant mortality rates and GDP). Bird and mammal abundances declined by 58% (25 – 76 %) and by 83% (72 – 90%) in hunted compared to unhunted areas. Species depletion distances extended up to 7 and 40 km from hunters' access points (roads and settlements) for birds and mammals, respectively. Additionally, hunting pressure was higher in areas with better accessibility to major towns where wild meat could be traded, and was negatively related with the availability of alternative protein sources (i.e., livestock density) and poverty levels. Mammal population densities were lower outside protected areas, particularly due to commercial hunting. We also found evidence of size-differential defaunation, with large-bodied species being more affected than small-bodied species in the proximity of access points. Finally, we used our models to create maps of hunting-induced defaunation for the Congo Basin and the Amazon. Strategies to sustainably manage wild meat hunting in both protected and unprotected tropical ecosystems are urgently needed to avoid further defaunation.

RADAR REMOTE SENSING BASED FOREST OBSERVATORY SUPPORTING INDIGENOUS COMMUNITIES, COLOMBIAN AMAZON

Marcela Quiñones, Sarvision; Carolina Gil, ACT-Colombia; Brian Hettler, ACT-Washigton; Claudia Huertas, ACT-Colombia; Santiago Palacios, ACT-Colombia

Deforestation and forest degradation are important causes of habitat transformation leading to species extinction and changes in ecological services. Forest cover from indigenous territories in the Colombian Amazon is expected to change rapidly due to national land use policies and legal or illegal activities. The Amazon Conservation Team (ACT) has dedicated to the support of indigenous communities in the legalization and management of their territories. Within the support strategy the installation of a multi-scale remote sensing based observatory of the forest changes is envisioned to

transfer up-to-date information to the local authorities. The regular and systematic observation of the forest at a regional level linked with a community based monitoring system, is expected to inform local indigenous authorities on the deforestation and degradation processes. Radar remote multi-temporal images acquired by operational radar satellites, offer a unique opportunity to pierce the frequent cloud cover of the tropical Amazonian forest for the production of time series to be used as an observation strategy. We present, here, the first products of this observatory: 1) A vegetation structural type map for the whole Colombian Amazon at 25 m resolution for 2007, to be used as a base line for the regional change detections; 2) A time series of three maps showing the changes occurred in the periods of 2007-to 2010. The legends include structural information of the vegetation and its flooding regimes, best described by the LCCS vegetation legend (developed by FAO). Validations of these maps were done using high resolution optical imagery and field based observations. Accuracies for all products are higher that 92 %. The creation of a regional user network for the observatory, as well as the creation of new products with updated information will occurred in the frame of a MacArthur project in the coming 3 years.

RECONCILING EXPERT AND STAKEHOLDER PREFERENCES FOR MARINE MANAGEMENT

Katrina Davis, University of Queensland; Michael Burton, University of Western Australia; Antoine Camus, Agro Paris Tech; Ram Pandit, University of Western Australia; Hugh Possingham, The University of Queensland; Jonathan Rhodes, The University of Queensland; Abbie Rogers, University of Western Australia; Alaya Spencer-Cotton, University of Western Australia

Marine spatial optimization models can help identify the optimal management of seascapes to maximise social welfare while meeting biodiversity targets. Management is controlled through zoning which separates different uses including fishing, recreation, and conservation. However, managers and the general public may have different preferences for marine management. This implies that expert-driven planning approaches may not attract the necessary public support to achieve biodiversity objectives. To understand public preferences for management, we elicited spatially explicit non-market values for marine ecological features in South-East Queensland in Australia. Our survey revealed that the Queensland population has higher existence values for different habitat types; for example, sea grass areas were valued twice as much as inshore reef areas. We combined these non-market valuation results with data on marine species' abundance and habitat type, recreational fishing benefits and commercial fisheries catch. All data were then analysed using a spatial optimization model to determine the optimal spatial allocation of the study area to meet Aichi targets for marine habitat protection while 1) minimising the amount of area allocated to conservation, 2) maximising market benefits, and 3) maximising both market and non-market benefits. By incorporating ecological, market and non-market values, the analysis aims to reconcile stakeholder preferences for marine spatial planning with 'expert-driven' ecological priorities.

REINTRODUCING FISH AND WILDLIFE POPULATIONS TO ACHIEVE CONSERVATION GOALS

Paul Angermeier, Virginia Tech; David Jachowski, Clemson University; Joshua Millspaugh, University of Montana; Rob Slotow, University of KZ-N

Species reintroduction is a rapidly growing, multidisciplinary tactic in the conservation of aquatic and terrestrial ecosystems. Objectives of reintroduction encompass recovering imperiled species, restoring ecosystem services, and facilitating colonization of novel environments. Reintroduction biology draws from disciplines such as ecology, epidemiology, ethics, ethology, genetics, physiology, and sociology. Success of previous reintroductions has been mixed, revealing many ecological, social, and institutional obstacles to the long-term persistence of reintroduced populations. However, important lessons have been learned from the collective reintroduction experience. We see an urgent need for strategic guidance on how to plan and conduct future reintroductions to ensure successful, cost-effective establishment and management of target populations. Herein, we integrate diverse expertise, concepts, and principles into an innovative approach for enhancing reintroduction success for a wide range of taxa and global regions. We summarize current thinking on how to a) assess appropriateness of reintroductions, b) set goals and measure success, c) surmount potential obstacles, and d) manage reintroduced populations over the long term. Enhancing reintroduction success will likely require broader socio-economic support, greater use of stakeholder-driven decision making, more emphasis on ecological processes, and a refined ethical framework. Finally, we identify key challenges and opportunities in reintroduction biology that we expect to emerge in the next few decades.

RESILIENCE OF PERI-URBAN SECONDARY FORESTS IN ANDEAN FORESTS TAXONOMIC AND A FUNCTIONAL PERSPECTIVE

Ana Hurtado, Ponificia Univerdidad Javeriana; Maria Echeverry-Galvis, Pontificia Universidad Javeriana; Diego Gonzalez, Conservation International Colombia; Natalia Norden, Instituto Alexander von Humboldt; Juan Posada, Universidad del Rosario; Beatriz Salgado-Negret, Universidad del Norte

An increasing extent of tropical forests are in some stage of recover from past human disturbance. In this context, evaluating the regeneration potential of secondary forests from both taxonomic and functional perspectives is key to understand resilience in tropical landscapes. This is particularly important in peri-urban areas, where human impact is considerable. Here, we combine data on tree and shrub taxonomic and functional composition across multiple life stages to evaluate the regeneration potential of successional stands near Bogotá city (Colombia), one of the most populated urban areas of South-America. To do so, we used a network of 20 20x20 m permanent plots established in early and late secondary forests across four locations. Overall, we censused 5473 individuals of adults, saplings and seedlings belonging to 85 tree and shrub species, a surprisingly high number for such a disturbed region. Seven of these species are endemic to Colombia and at least another one (*Prunus buxiflia*) is categorized as vulnerable. Our results showed that early secondary stands may approach a similar taxonomic and functional composition to that of late secondary stands. Location was the most important factor determining species and functional composition, followed by successional stage, and then life-stage. Although some species occurred in all plots, each location was characterized by a set of a few locally dominant species. Interestingly, within a plot, species that were dominant at the seedlings stage were different to those that dominated the tree stage, suggesting an important successional species turnover. Overall, several mature forest species were successfully regenerating in secondary stands, demonstrating that fragments of young secondary forest in this peri-urban area have the potential for maintaining species diversity and ecosystem function in highly human-impacted Andean forest.

RESILIENCE-BASED SPATIAL PRIORITIZATION OF TROPICAL FAUNA

Rebecca Brunner, University of California, Berkeley

Despite the dynamic nature of the forces threatening biodiversity, conservation planning has largely been a static exercise. The two general factors that contribute to species vulnerability are resistance, or the ability to survive an environmental disturbance, and resilience, or the ability to recover and persist after the disturbance event. Although resilience is a crucial component of species vulnerability assessments, it remains a difficult concept to incorporate into conservation planning because it derives from species traits that are not inherently spatial, such as reproductive output and dispersal ability. Recent studies have begun to advocate for the integration of species distribution models (SDMs) and trait-based vulnerability assessments (TVAs) in conservation planning. We build on this idea by integrating SDMs into a spatial prioritization algorithm (Zonation) and weighting by ranked natural history and behavioral traits correlated with resilience. Our study identifies priority areas for 163 species in the Australian Wet Tropics, a hotspot for biodiversity and a region particularly susceptible to climate change. Our approach incorporates the traits and distributions of species from four taxonomic groups (frogs, birds, reptiles, and mammals) rather than a single species or taxon, which introduces difficult but necessary tradeoffs relevant to real-world management decisions. We find that incorporating resilience as a weighted parameter increases the proportion of most species' distributions by 1-17% under various scenarios of landscape loss—especially for endemics—and that these results overlap with 70% of the identified climate refugia areas for the region. Our results, which include ranked priority maps, are meant to inform future management decisions, as well as to serve as a case study for other regions.

RESOLVING A CONSERVATION DILEMMA: VULNERABLE LIONS EATING ENDANGERED ZEBRAS

Margaret Kinnaird, WWF-International; Timothy O'Brien, Wildlife Conservation Society

When predators are controlled or eliminated across a landscape, prey populations tend to increase. Alternatively, when predators recover, prey densities should decline to pre-control levels. Rare prey species, however, may decline further than expected or disappear altogether. Recently, concern about the impact of recovering predator populations on wildlife in Laikipia County, Kenya, has led to questions of whether Lions (*Panthera leo*, IUCN Rank Vulnerable) exert top-down pressure on Grevy's zebra (*Equus grevyi*, IUCN Rank Endangered). We examine effects of lion predation on populations of Plains zebra (E. quagga), a locally abundant prey species, and Grevy's zebra in a 2105 km2 study area in Laikipia, Kenya. We used line transect surveys to estimate density of Grevy's (0.71/km2) and Plains (15.9/km2) zebras, and satellite telemetry to develop movement data for lions and both zebra species. We tracked lions to potential kill sites to

determine predation rates on zebras. We compared field-based estimates of predation rates on zebras to random gas models of encounters between lions and zebras that resulted in predation. We used these data to ask if lions prey preferentially on Grevy's zebra and whether predation is at a sufficient rate to drive population declines. Lions preyed on Grevy's zebra less than expected and preyed on Plains zebras as expected or less than expected in 15 of 16 scenarios. Grevy's zebra population trends indicate that the Kenya population stabilized around 2005, and recruitment rate has tripled since 2004, making it unlikely that lions are having an impact on Grevy's zebras. Competitive displacement by livestock (Livestock: Grevy's zebra ratio = 864:1) and interference competition for grass by Plains zebra (Plains zebra: Grevy's zebra ratio = 22:1) rather than predation, are most likely the predominant threats to Grevy's Zebra recovery.

RESTORATION OF A BLACKBERRY INVADED UNIQUE FOREST IN GALAPAGOS

Jacqueline Rodríguez, Charles Darwin Foundation

The unique fauna and flora of The Galapagos Islands have experienced very few extinctions due to the protection of the area as a National Park. However, agriculture activities in the past and the current invasions by introduced species have negatively affected plants and animals of the inhabited islands. Blackberry (*Rubus niveus*) and other introduced species have invaded a unique forest on the Galapagos island of Santa Cruz, dominated by the endemic tree *Scalesia pedunculata*, which is a key habitat for Darwin's finches. High cover of the invasive Rubus has led to significantly lower native plant species richness and cover, as well as to changes in the Scalesia forest structure. The use of herbicides by the Galapagos National Park Directorate to control these invasive species may have additionally led to changes in plant communities and in the species composition of invertebrates, which could negatively affect the insectivorous birds. We initiated a community level study to determine the effects that the invasive species control has on the plant, invertebrate and bird communities. Our data suggests that the control had an initial negative impact on the finch breeding success, since herbicide usage results in the temporary removal of most of the understory, thus reducing the food supply during chick rearing. However, after an initial drop in the number and cover of plant species after herbicide usage, the recovery of native plant species, especially that of the endemic *Scalesia pedunculata* was spectacular. Whereas there were no Scalesia seedlings in heavily Rubus-invaded plots, over 300 seedlings were counted in some of them only 5 months after the last herbicide application was carried out. These results suggest long term benefits of the restoration efforts of the Scalesia forest carried out by the Galapagos National Park Directorate.

ROBUST MONITORING OF FOREST COVER FOR CONSERVATION SCHEMES IN MEXICO: GLOBAL VS NATIONAL MAPS

Stephane Couturier, Universidad Nacional Autónoma de México, UNAM; Dr Jean-Francois Mas, Centro de Investigaciones en Geograf?a Ambiental, CIGA; Mtro. Javier Osorno-Covarrubias, Instituto de Geografía, IGg

Many financial incentives for forest conservation in the subtropics depend on Monitoring, Reporting and Verification (MRV) schemes, and statistical accuracy for error margins determination of forest cover change is a criterion which appears or will appear in these MRV. In this context, accuracy assessment methods have been developed in the past ten years for land cover cartography in Mexico. In the meantime, automatic land cover change algorithms have been developed internationally and applied to satellite imagery to propose global land cover change products. However, no robust assessment of forest cover change has been published yet at national level for Mexico. We present in this contribution recent advances of an accuracy assessment design for land cover cartography at the national level in Mexico, based on several novel features: 1) a sampling design that efficiently controls the spatial distribution of samples for all classes, including change classes, 2) an interpretation protocol based on fuzzy logics which minimizes biases in the calculation of accuracy indices, and 3) A preliminary on-line visualization of the assessment material, which promotes the transparency of the assessment to the public. We implemented this accuracy assessment method to probabilistically assess the accuracy of the "Global Forest Cover Change" (GFCC, Hansen et al., 2013) and the forest cover change derived from the official INEGI cartography. Our preliminary results show that overall, the INEGI national forest change map is more accurate than GFCC. However, the GFCC map detects deforestation events much better than the INEGI map. We recommend the adoption of accuracy assessment methods such as ours to report national level deforestation in Mexico and other subtropical countries, with the desirable consequence of enhancing the statistical robustness of FAO reports worldwide.

SATELLITE-BASED ESTIMATES OF DEFORESTATION RATES IN THE BRAZILIAN AMAZON OVER THE LAST 40 YEARS

Diana Marcela Velasco, JRC; Rene Beuchle, JRC

Monitoring forests and the changes in forest cover are crucial to assess national greenhouse gas emissions, carbon storage, biodiversity loss, soil erosion and forest productivity. Here we show how analyzing freely available data with open source software can provide valuable insights into forest loss and changes in land cover type. We provide a complete picture of historical forest cover change in the Brazilian Amazon biome between 1975 and 2015 based on a regular sampling of remote sensing imagery. We used data from current and historical Landsat sensors: Multispectral Scanner (MSS), Thematic Mapper (TM), Enhanced Thematic Mapper Plus (ETM+) and Operational Land Imager (OLI). A systematic sample of 1740 Landsat image subsets, each 10 by 10 km in size, and located on a grid defined by the full degree confluence points, were analysed for five reference years: 1975, 1990, 2000, 2010, and 2015. We classified the land cover into five classes: tree cover, tree cover mosaic, other wooded land, other land cover, and water. The classification results were corrected by visual interpretation, and, when available, by comparison with higher resolution imagery and visual control by national forestry experts. Forest cover change was estimated for the entire Brazilian Amazon forest biome and compared with existing studies in the area. Our results show a net decrease of forest cover of 24% in the last 40 years in the Brazilian Amazon with an average yearly net forest cover change rate of -0,71%. Our analysis of rates and spatial patterns of forest loss and regrowth can lead to a better understanding of the impact that forest cover change has on biodiversity, and of the drivers of deforestation, over a longer time period than hitherto possible.

SAVING FRESHWATER CRAYFISHES: EXTINCTION DRIVERS IDENTIFICATION AND ECOSYSTEM SERVICES ASSESSMENT

Raoul Manenti, Università degli Studi di Milano, Dipartimento di Bioscienze; Claudia Canedoli, University of Milano-Bicocca; Emilio Padoa Schioppa, University of Milano-Bicocca

In northern Italy, the native crayfish *Austropotamoboius pallipes*, once largely widespread, is currently at the edge of extinction in numerous hydrographic basins. Since the early two thousand the spreading of allochthonous crayfishes, carrier of a dreadful pathology, added its detrimental effect to habitat pollution and alteration in threatening the survival of native populations. Our study aims to perform a large-scale research of the relationships between freshwater pollution and alien crayfish spreading in determining extinctions of native crayfish populations in Alpine and Apennine countries. Moreover, we want to assess the differences in ecosystem services provision among sites with and without populations of *A. pallipes* and identify management strategies to prevent further spreading of alien crayfish species. During 2016 we sampled 194 sites, 140 lotic, 54 lentic. We chose 101 sites in which the native species *A. pallipes* occurred till 2006 before American crayfishes (spp?) spreading and in which there were available data on the water quality. We sampled each of the 194 sites at least twice during this period in order to assess the crayfish detection probability and we repeated environmental analyses. *A. pallipes* still occurs in 63 sites, while in 38 sites is extinct. No significant environmental changes occurred in the extinction sites, but we found at least one site occupied by a species of alien crayfish in the same catchment basin. Alien crayfishes are mostly linked to lentic habitats that provide ecosystem services for fishing and recreational activities. In streams, barriers like polluted stretches or dams played a role in allowing the persistence of native populations, although strongly isolating them, by preventing contacts with the pathology carried by allochthonous crayfishes. Conservation actions of native species that take into account the provision of wetlands ecosystem services are urgently needed to prevent further alien crayfish spreading.

SCHOOL MONITORS BRINGING NATURE INTO THE CLASSROOM

Osvaldo Ramirez Bravo, Benemérita Universidad Autónoma de Puebla

Public participation could be an important tool to generate information about ecosystems and species at regional level. However, a limitation in certain countries is the lack of opportunities to get involved, or the lack of knowledge on how to undertake surveys. Recently in Mexico there has been an attempt to increase the interest in conservation in basic and middle level schools by making mandatory the inclusion of activities related to it. However, there is not a clear definition on which activities should be included which has resulted in a misunderstanding of the concept. Thus, it is necessary to undertake different actions such as citizen science that could involve students in conservation actions. I developed a 20-hour workshop in "Monitoring Biodiversity" for interested groups of different levels. The first workshop had place in the community of Tepeaca, in the state of Puebla in Central Mexico in a public high school that had a group of students interested in conservation. It had a duration of 5 weeks during which we focused in biodiversity, its distribution in Mexico, threats, extinction, the use of maps, how to take notes in the field, use of field guides and equipment and how to undertake sampling of mammals, vegetation, birds, amphibians, reptiles and insects. During the workshop we

had practicals in the school yard, so students could get prepared for a 2-hour field trip to a nearby disturbed area with little information on biodiversity. During the practical we had the aid of biology students to verify participants were applying the methodologies correctly. At the end of the field trip students were able to identify 4 mammals, 4 birds, 2 reptiles and 8 plants and different insects. I consider that the generated workshop is useful to involve students in conservation by increasing their knowledge of biodiversity. The next step is to involve other schools in the area in a project about regional biodiversity

SEARCHING FOR A PROBIOTIC CURE FOR THE AMPHIBIAN CHYTRID FUNGUS BATRACHOCHYTRIUM DENDROBATIDIS

Brian Gratwicke, Smithsonian Conservation Biology Institute

Supplementing the skin microbiome with bacteria that produce antifungal metabolites has been advocated as a potential tool to control the deadly amphibian disease chytridiomycosis, but previous attempts to develop an antifungal probiotic for Panamanian golden frogs have been unsuccessful. We isolated a core skin microbe of the genus Comamonas from Panamanian golden frog skin and genetically modified it to produce the known antifungal metabolite violacein. We used the modified microbe to augment the skin microbiomes of surplus-bred captive Panamanian golden frogs prior to exposure to amphibian chytrid fungus to test for any protective effect of the probiotic treatment. In a second treatment group, we exposed frogs to cocktails of antifungal bacteria cultures isolated from Panamanian golden frog skin. This experiment successfully tested two novel, technically-challenging approaches to probiotics that have been suggested to advance the field, but we did not observe any survival benefits to the frogs.

SEED FATE OF THE THREATENED AND LARGEST PALM ALIVE

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Palms (Arecaceae) have been regarded as a 'keystone resource species' for frugivores; their disappearance may have a cascading effect on natural ecosystems. Human-induced disturbances that may cause the loss of such species should have dramatic consequences for the ecological functioning of ecosystems and the essential services these species deliver. Until now, very little attention had been paid to the 'wine palm', Jubaea chilensis, a relict and endemic species, and one of the most emblematic tree species of Chilean flora. In this study, we explored the effects of overharvesting, the invasive exotic Norway rats (*Rattus norvegicus*), and caviomorph rodents from central Chile, the degu (*Octodon degus*) and coruro (*Spalacopus cyanus*), on the fate of wine palm seeds. Through the telemetric thread tag method, we assessed the fate (cached or preyed upon), seed predation (by caviomorph rodents or Norway rats) or dispersal distance of seeds in the areas under different seed extraction and rat's invasion regimes. Our results indicate that seed predation is higher on intermediate levels of human impact because rodents (native and exotic) are benefited on the area. However, the two species of caviomorphs differ in their interaction with wine palm seeds. The degu removes wine palm seeds intensely, while coruro, occasionally. Also, the development of Alzheimer's disease in old age on degu could be one advantage to seed dispersal, increasing the likelihood of propagules being dispersed, buried, but forgotten. Seed predation by Norway rat, however, is the strongest rodent-seed interaction. Understanding dynamics, the mechanisms and responses to anthropogenic disturbances that sustain or constrain relict species regeneration as wine palm should serve as baseline for future management policies in ecosystems that depend on uncertain climatic events.

SELECTING JUVENILE GIANT PANDAS FOR ASSISTED SOFT RELEASE PROGRAMS

Ramana Callan, Chengdu Research Base of Giant Panda Breeding

Captive breeding programs are essential components of many recovery plans. Ultimately, the goal of these breeding programs is to augment existing wild populations. However, after generations in captivity, individuals may exhibit low fitness when translocated to wild environments. In particular, activity levels and vigilance can be considerably reduced and lead to low survival rates. Thus, selecting captive bred juveniles that display higher vigilance and activity levels when compared to their peers should increase the overall success of reintroduction programs. To address this issue, we developed a standardized three-step process for selecting juvenile giant pandas (*Ailuropoda melanoleuca*) for assisted soft release. Based on IUCN and AZA recommendations, we began with genetic criteria to ensure that we release cubs similar to the host population. Next, we assessed the overall health of the cubs based on blood chemistry and medical history. Finally, we observed the behavior of the cubs and evaluated various attributes such as mobility,

climbing ability, activity level, social aptitude, exploratory behavior, and vigilance. We measured vigilance by exposing the cubs to various novel stimuli and quantifying their reactions based on response category and time. Because the selected cubs will become part of an assisted soft release program, we also needed to assess how they interact with humans. In 2017, we used this methodology to select two cubs for release from a pool of 23 possible captive bred individuals. This comprehensive stepwise approach encouraged interdisciplinary collaboration within our institution and can be applied to other mammalian species. In addition to making selection non-subjective and assuring that we release the best available cubs, this systematic process will allow us to test our assumptions regarding which criteria are most important for survival.

SENTIMENT ANALYSIS IN CONSERVATION: MORE FACTS, LESS GUT FEELING

Margreet Drijfhout, La Trobe University; Peter Green, La Trobe University; Dave Kendal, University of Melbourne; Dany Vohl, Swinburne University of Technology

When an iconic species becomes a conservation threat, management can become complicated quickly. Managing species based on scientific knowledge is one thing, aligning this knowledge with public opinion is another. Public opinion is known to have changed policy more than once, but what evidence is this assessment of opinion based on? A gut feeling? A few loud people? How can we collect empirical evidence on public opinion to support decision-making? This question is at the core of our study. We use Sentiment Analysis – an emerging research area in computer science and novel approach in conservation – to quantitatively analyze sentiments expressed online about the potential culling of one of the world's most beloved species, the koala. The koala is a species that in parts of Australia is considered overabundant. Its overbrowsing can kill entire forests, impacting other species and leading to starvation of koalas themselves, fueling the call for culling by experts. Public outcry however has prevented this from happening. We compare sentiments in comments on news stories about koala culling vs kangaroo culling. While kangaroos are also an iconic Australian species, they are often culled when overabundant. We hypothesized that comments on koala culling (n=443) would express more negative sentiment than comments on kangaroo culling (n=447). Our results confirmed the average sentiment found was negative in both cases. Surprisingly we found no significant differences in the average sentiment between species. However, overall levels of sentiment (positive & negative) were higher in comments on kangaroo culling (resp. 75%, 79%) than on koala culling (resp. 60%, 71%), suggesting that public opinion is not as against culling koalas than previously thought. These results provide empirical evidence to support decision making on this sensitive topic, and importantly, these methods can be applied to other challenging conservation situations in which public opinion is a major factor.

SERRANÍAS DE GUAVIARE, COLOMBIA: RAPID INVENTORY, CONSERVATION, CAMPESINOS, AND THE PEACE PROCESS

Lesley de Souza, The Field Museum; Corine Vriesendorp, The Field Museum; Alejandra Salazar, Fundacion para la Conservacion y Desarrollo Sostenible; Diana Alvira, The Field Museum; Arelis Arciniegas, CDA; Rodrigo Botero, Fundación para la Conservación y Desarrollo Sostenible; Pablo Rodriguez, PNN, GEF Corazon de la Amazonia

In 2015 President Santos made a commitment to 2 million hectares of new protected areas in Colombia, including a potential regional conservation area in Guaviare. In October 2016 The Field Museum, 12 Colombian partner institutions, 26 Colombian scientists, and dozens of local leaders and community members conducted a rapid biological and social inventory of the Serranias del Nor-Occidente de Guaviare, four rock uplifts emerging from the Orinoco basin. For decades, this region has been a "no-go" zone controlled by FARC guerillas and isolated by 50 years of civil war. Ancient art—mysterious paintings from an unknown civilization 7,000-13,000 years ago—covers the sheer sandstone rock faces. Modern colonization of the area is relatively recent, with people arriving from the Andes in the last 60-100 years to escape violence and seek their fortune. Cattle ranching and coca plantations dominate local livelihoods. For the 5,000 people living in surrounding villages and farms, the uplifts represent an important source of water, for them and their livestock. During 9 days in the field, we recorded 807 species of plants and 453 species of vertebrates—a singular assemblage of species from the Amazon, Orinoco, and Guiana Shield—with more than a dozen species new to science. Strong geological, archeological, and biological arguments support creation of a 42,300-ha regional conservation area, with solid support from local campesinos. Nearby and sometimes overlapping mining, oil, and road development projects—coupled with an institutional and political transformation as the peace process is implemented—add urgency to protecting the area now.

SETTING CONSERVATION PRIORITIES IN DYNAMIC MIGRATORY NETWORKS

Kiran Dhanjal-Adams, Centre for Ecology and Hydrology & Swiss Ornithological Institute

Migratory species are declining at greater rates than non-migratory species. Setting conservation priorities for migratory species requires the identification of discrete breeding, stopover and non-breeding habitat patches. However, for many species, identifying discrete patches of habitat can be complex, particularly when so little is known about they migrate. Furthermore, many species have very diffuse ranges, making it difficult to identify discrete habitat patches. Novel tracking and remote sensing techniques therefore offer a fresh opportunity to study habitat use by migratory species. Here we use both to (i) identifying important stopover habitat, (ii) understand how environmental conditions can drive habitat use, and finally (iii) investigate how dynamic migratory networks change conservation priorities. We use the case study of *Upupa epops* (hoopoe) migrating from Europe to Sub-Saharan Africa to demonstrate how hotter and drier years increase connectivity between sites, as birds are forced to forage further for food. We also show that sites worth investing conservation effort in during dry years, are different from those worth investing conservation effort during wet years, requiring more dynamic conservation approaches.

SHARPENING THE RESOLUTION OF BIODIVERSITY INDICATORS TRANSFORMS GLOBAL PICTURE OF STATUS AND TRENDS

Simon Ferrier, CSIRO; Tom Harwood, CSIRO; Andrew Hoskins, CSIRO; Chris Ware, CSIRO; Kristen Williams, CSIRO

Two of the most widely employed indicators of global status and trends in terrestrial biodiversity are the proportion of land included in protected areas, and the proportion covered by relatively natural habitat. The spatial units against which these indicators are measured and reported – e.g., countries, ecoregions, major ecosystem types – are typically very large relative to the spatial grain of key environmental drivers shaping patterns of both biological distribution and land use. This mismatch of scales may limit the capacity of indicators to account for pervasive biases in the location of habitat loss and protection towards particular environments, and therefore particular biological elements, within reporting units. Here we explore this issue using modelling of spatial turnover in biological composition (beta diversity) across the entire terrestrial surface of the planet at an unprecedented 1km grid resolution. Results generated by combining this modelling with high-resolution global data on protected-area boundaries and forest habitat change indicate that high covariance between spatial patterns of biological distribution and of habitat loss and protection at landscape scale significantly amplify potential consequences of habitat loss and inadequate protected-area coverage for biodiversity. This finding suggests that previous assessments based on proportional coverage of protected areas and natural habitats within relatively large reporting units have provided an overly optimistic perspective on biodiversity status globally.

SHER KHAN, BAGHEERA, AKELA AND MOWGLI: CURRENT CONSERVATION PICTURE IN KIPLINGS YARD

Anindita Chatterjee, Wildlife Institute of India

India, home to nearly 1.3 billion people, still harbours almost 2500 tigers and 8000 leopards. Standing at the toughest crossroad of conservation, this shows hope. Our endeavour is to device successful conservation strategies in an interdisciplinary approach by considering scientific evidences of species' ecology and people's attitude towards them. Camera trap based spatially-explicit-capture-recapture (SECR) framework was used to estimate spatio-temporal dynamics of three sympatric large carnivores: Tiger, Leopards and Asiatic Wild Dogs and their principal prey in Pench Tiger Reserve (PTR), Madhya Pradesh, Central India. Kill sites were monitored over a period of three years to recognize the predation hotspots of wild prey and domestic livestock with respect to their density. Close-ended structured questionnaire surveys were carried out in 15 villages in zone of influence of PTR for people's attitude and perception towards wildlife. Study species were segregated both on spatial and temporal scale. Most of the livestock depredation was on the grazing path near the core area of PTR where human-wildlife interaction peaks. Results showed that local residents harbour no ill will towards the large carnivores but the feeling of resentment towards wolves, crop-raiding ungulates as well as the local authorities was through the roof. 78% of the local residents said that the protected area was detrimental for them. Our findings corroborate that the rate of livestock depredation can come down by altering the grazing paths. The need of proper compensation for both livestock and crop is crucial to sustain these animals in a human-dominated landscape is substantiated. Locales' participation to conserve these animals is vital at this juncture. Successful conservation strategies can only be formed by the active participation of the native people. They are the deciding factor at this crossroad whether to transform this struggle into a successful conservation story.

SOCIAL ASSESSMENT AS BASIS FOR PROMOTING AN INTEGRATED MANAGEMENT APPROACH AT LIBERIA'S OLDEST PA

Shadrach Kerwillain, Fauna and Flora International; Mary Molokwu, Fauna & Flora International, Liberia; Kathryn Phillips, Fauna & Flora International; Rob, cxl Small, Fauna & Flora International; Matthew Varney, Fauna & Flora International

Containing 1,804 km2 of lowland tropical rainforest, Sapo National Park (SNP) is Liberia's foremost protected area (PA) and only national park. It holds many threatened and endemic species including some of the largest populations in Liberia of the western chimpanzee *Pan troglodytes verus* (CR), the Pygmy Hippopotamus *Choeropsis liberiensis* (EN), the Jentink's Duiker *Cephalophus jentinki* (EN), and the Forest Elephant *Loxodonta cyclotis* (VU). Established in 1983 by an executive order during a military regime, Sapo has been managed with limited consultation of and engagement with communities around the park. In recent years, Liberia has adopted more community friendly management approaches, with two other PAs currently co-managed with communities. However, the management of SNP remains relatively militarised with limited effectiveness. This approach coupled with limited resources to implement basic park operations such as law enforcement has given rise to a surge of illegal activities that now threaten the ability of Sapo to protect biodiversity. In addition, existing relationship with local communities has further deteriorated as complaints of crop raiding by animals and in particular, the 2003 extension of the park boundaries are a continued source of strife. We present the outcomes of a social assessment aimed at improving understanding of communities' perception of park-related impacts on their livelihood and well-being, to inform the process of enhancing the effectiveness of park management. Using the Social Assessment of Protected Areas (SAPA) methodology, we investigated these issues in 50 communities around SNP. We show results of this process to demonstrate its effectiveness in collecting information that integrates communities' and management's interests and concerns, for effective PA management. Additionally, we present the challenges and lessons learned in introducing community-friendly management approaches in a slow progressing protectionist setting.

SOUNDSCAPE AND ACOUSTIC ANALYSES FOR BIODIVERSITY MONITORING IN PROTECTED AREAS

Ivan Campos, ICMBio - Instituto Chico Mendes de Conservação da Biodiversidade; Anne Gaskett, University of Auckland; William Lee, Landcare Research; Louis Ranjard, Australian National University

Global biodiversity declines and scarce funding for conservation mean it is critical to improve the efficiency of collecting biodiversity data. Recent advances in sound-recording technologies now enable recording of acoustic soundscapes for many species simultaneously for extended time periods. This allows study of community and population dynamics in the soundscape, and well as changes over days, months and even years. There are many methods for converting soundscape recordings into biodiversity indices. We are testing the effectiveness of several different analyses and indices for biodiversity in protected areas in Brazil and New Zealand. We are also optimising automated identification of target species calls. Here we present a study comparing several models for automatic species identification of calls from five species in one of the most endangered bird families, the Procellariiforme or tubenosed seabirds, from soundscape recordings made at Burgess Island, New Zealand. Automated identification studies commonly focus on increasing detection rates, but this results in very large data files and numerous false positives where calls (and thus species) are inaccurately identified. Our approach, Assemblage of Recognition Models' Summary – ARMS, focusses on extracting more trustworthy information from the recording sections with the highest probabilities of providing accurate identifications. ARMS prioritises low false positive rates instead of high detection rates and accuracy. Compared to a basic model, use of our ARMS model improved the precision of call identification from as low as 0.05% for some species, to over 90% for all species. Passive acoustic monitoring and automatic recognition are powerful new tools for species conservation worldwide. We aim to provide practical methods for conservation managers that reduce costs, time and expertise needed to conduct biodiversity and target species surveys.

SPACIAL DISTRIBUTION OF MURIQUIS IN A FRAGMENTED LANDSCAPE IN BRAZIL

Danielle Moreira, Universidade Federal do Espírito Santo; Luana Centoducatte, Universidade Federal do Espírito Santo; Francisco Barreto, Universidade Federal do Espírito Santo; Sérgio Mendes, Universidade Federal do Espírito Santo

Natural habitats are being transformed by deforestation and new patterns of land use, changing the connectivity between habitats and influencing the persistence of species in the landscape. In the last 15 years, the Muriqui Project has been running ecological and conservation researches of the northern muriqui - a critically

endangered primate, endemic of the Atlantic Forest in Brazil - in order to manage one of the last known populations. Here, we used field collected data, graph theory and individual-based spatially explicit models to analyze the muriqui population response to landscape features, making inferences about the distribution of groups, animal movement, and population growth. From 1970 to 2008, forest cover increased almost three-fold; and patch size, connectivity and forest growth influenced the distribution of muriquis. Muriqui's persistence was ensured by forest regeneration and their ability to explore secondary forests. Isolated forest patches changed the typically female-biased dispersal pattern of muriquis. At least five females stayed in their natal group and bred, while others left the group and became solitary. In order to evaluate future impacts of forest fragmentation on muriqui populations, we developed a model that simulates movement behavior across the landscape by using population dynamics outputs to regulate the events of migration. The simulation resulted an average population increase of 2.4-fold in 50 years, with female migration playing an important role. However, more than 60% of females will probably have no success in finding a mating partner because their dispersal will lead to patches with no muriquis. For species with dispersal process such as the muriquis, connectivity may be as important as habitat size. For conservation purposes, we have worked with the government to improve the connectivity between patches; to translocate young females within social groups; and to establish a protected corridor of biodiversity.

SPATIAL AND SEASONAL EFFECTS ON RAILWAY USE AND MOVEMENT BY GRIZZLY BEARS IN BANFF NATIONAL PARK

Sonya Pollock, University of Alberta; Scott Nielsen, University of Alberta; Colleen Cassady St Clair, University of Alberta; Jesse Whittington, Parks Canada

Train collisions have become a leading cause of recorded mortality for a vulnerable population of grizzly bears in Canada's Rocky Mountain Parks. Minimizing collision risk will require information on factors that attract rail use by bears, which could include natural and anthropogenic food, ease of travel, adjacent human use, and the social dynamics of bears. We examined eight years of data from GPS-collared grizzly bears with home ranges in Banff and Yoho National Parks to identify areas with the greatest use by bears. We then sought to identify the more specific locations associated with choices to use, or not, the rail by contrasting bear movement steps (i.e., as two successive GPS points) that (a) entered versus crossed and (b) continued along versus exited the railway. Bear use of the railway peaked in the spring and fall, with greater selection for high soil wetness, but low canopy cover and large-scale greenness (within 500 m). Use also increased closer to railway sidings, human-use trails, and wildlife crossings on the adjacent (fenced) highway, but farther from towns. Bears exhibited shorter steps, indicative of slower movement and more prolonged use, when they entered or continued on the rail, particularly in areas with high herbaceous cover and greater terrain ruggedness. Entry points were also closer to railroad sidings and landfill sites, and in areas with low broad-scale greenness values. Among our five-use metrics (overall and four step types), only crossing was associated, but weakly so, with the locations of documented grizzly bear mortalities. Overall, our results suggest that bears use the rail for a combination of forage and movement benefits and that risk of mortality is associated with additional variables.

SPATIAL ASSESSMENT OF BIODIVERSITY PATTERNS IN THE BAY OF BISCAY USING UNDERWATER VIDEO RECORDINGS

Maud Mouchet, MNHN; Dorothée Kopp, IFREMER; Laurène Mérillet, IFREMER; Marianne Robert, IFREMER; Michèle Salaün, IFREMER

The collapse of major fisheries (Peruvian anchovy fisheries in the 1970s, Atlantic Northwest cod fisheries in the 1980-90s) raised awareness on the overexploitation of marine resources and increased the demand of academics and policy-makers for integrating stock assessment in an ecosystem-approach of fisheries. The recent development of remote sensing monitoring, such as underwater video surveys, has opened new opportunities to observe the state of the seascapes and living organisms, especially the ones rarely caught using traditional bottom-trawling or heavily damaged in the process. We used video recordings of the soft substrates of the fishing ground "Grande Vasière", in the Bay of Biscay (France), captured during the scientific campaign LANGOLF TV which aimed at evaluating Norway lobster stocks. In 2014, standardised video footages were recorded on 152 sites, regularly distributed along a reference grid, across the 12,000km² of the area. Each individual (e.g., fish, macroinvertebrate) occurring on video footages was identified to the finest taxonomic level possible and counted. We then evaluated and mapped species turnover using Baselga's framework, discriminating nested and true turnover, to investigate whether any biotic homogenisation was occurring in the area. Patterns of turnover were further overlapped with an indicator of fishing pressure. One step further, we tested whether fishing pressure and/or environmental conditions (temperature, depth, sediment type) drove species turnover using a distance-based approach. Overall, our results showed a complex spatial biodiversity pattern

driven by both fishing and environmental gradients. Combining both fishery management and conservation goals, we present one of the first studies to map and evaluate biodiversity patterns using video footages initially recorded stock assessment.

SPATIAL CONSERVATION PLANNING WITH FEEDBACK EFFECTS HARNESSING ASYMMETRIC INFORMATION INCENTIVES

Cecilia Larrosa, University of Oxford; Cristina Banks-leite, Imperial College London; L. Roman Carrasco, National University of Singapore; E.J. Milner-Gulland, University of Oxford; Leandro Tambosi, Universidade de Sao Paulo

In order to design cost-effective conservation interventions, conservation planners need to consider dynamics of the system throughout the planning process. However, there is a lack of conservation planning studies that empirically assess the effect of both environmental and social feedbacks simultaneously, and evaluate interventions other than land purchases. By focusing on a farmland set-aside restoration programme for the Brazilian Atlantic Forest (BAF), we propose the first methodological framework to prioritise a large-scale set-aside programme that enables accounting for both environmental and social feedbacks simultaneously. We model an environmental feedback that accounts for changes in forest connectivity, and an economic feedback that accounts for changes in the opportunity cost of farmland promoted by informational rent capture. As expected, total cost of meeting the restoration target was cheaper for the dynamic than the static solution (244 million USD, 6.4%). Large variability was observed in the difference in costs, benefits, and cost-effectiveness between approaches for different biogeographical subregions, and models of the effect of municipality characteristics on the difference between solutions showed that the optimal approach in the BAF is region-dependent. Most importantly, the analysis showed that a dynamic approach can help decision-makers optimise the existence of informational rents by prioritising areas with higher informational rent capture, while still resulting in a lower overall intervention cost. Accounting for environmental and economic feedbacks can be a valuable tool for more evenly distributed interventions that provide higher incentives for participation without increasing intervention cost.

SPATIAL CONSERVATION PRIORITIZATION OF BIODIVERSITY SPANNING THE EVOLUTIONARY CONTINUUM

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Accounting for evolutionary relationships between and within species is important for biodiversity conservation planning, but is rarely considered in practice. Here we introduce a novel framework to identify priority conservation areas accounting for phylogenetic and intra-specific diversity, integrating concepts from phylogeny, phylogeography, spatial statistics and spatial conservation prioritization. The framework consists of four main stages: 1 – Map species distributions; 2 - Map inter-specific phylogenetic diversity (PD); 3 - Map intra-specific lineage diversity (LD); and 4 - identify spatial conservation priorities for evolutionary diversity. We illustrate the usage of the framework using amphibian and reptile species occurring in the Iberian Peninsula, aimed at fulfilling four different conservation objectives: to maximize representativeness of (1) species, (2) phylogenetic diversity and (3) intra-specific lineages; and, combining all levels, to (4) represent diversity spanning the inter- and intra-specific evolutionary continuum. We found that explicitly incorporating phylogenetic and intra-specific diversity in systematic conservation planning provides advantages in terms of maximizing overall biodiversity representation while enhancing its persistence and evolutionary potential. Our results emphasize the need to account for the evolutionary continuum in order to efficiently implement biodiversity conservation planning decisions.

SPATIAL MODELING OF FUNCTIONAL CONNECTIVITY A NOVEL APPROACH TO PREDICTING BIRD SPECIES DIVERSITY

Christina Buelow, James Cook University

A complex network of forests and woodlands commonly typifies coastal landscapes. In northeast Australia, coastal forest networks provide important habitat for many generalist bird species that use multiple forest types. However, fragmentation puts the functionality of forest networks at risk. Also, whether a forest network is functionally connected depends on the distances that individual species are able to travel. Although generalists are often considered low-conservation priorities, effective management of functionally connected coastal forest networks is needed for maintenance of bird species diversity. We developed spatial models of functionally connected coastal forest networks for bird assemblages of northeast Australia, based on multiple Conefor connectivity indices (i.e., number of links (NL), number of components (NC), integral index of connectivity (IIC),

and patch area (A)). Generalist bird species with similar movement abilities were surveyed in four coastal forest types (mangrove, Eucalypt, rainforest, and Melaleuca) at ten survey locations along the northeast coast. Spatial models of functionally connected coastal forest networks were then used as predictors of bird species diversity and turnover in generalized dissimilarity models (GDMs). This approach allowed the identification of forest patches with high connectivity value for coastal bird assemblages, indicating candidacy for prioritization in conservation planning. This research also provides a novel approach to quantifying functional connectivity in heterogeneous landscapes, and can be applied as a predictive management tool across other taxa and locations.

SPATIAL PLANNING OF CONTROLLED BURNS TO ACHIEVE MULTIPLE OBJECTIVES IN A FIRE-DEPENDENT ECOSYSTEM

Brooke Williams, The University of Queensland; Ronald Baker, College of Science and Engineering, James Cook University; April E Reside, Centre for Biodiversity and Conservation Science, University of Queensland; Marcus Sheaves, College of Science and Engineering, James Cook University

There is potential for negative consequences for the ecological integrity of fire-dependent ecosystems as a result of inappropriate fire regimes. This can occur when asset (property) protection is prioritised over conservation objectives in burn programs. Optimisation of fire management for multiple objectives is rarely undertaken. We use integer linear programming to identify burn-scheduling solutions that cost-effectively achieve asset protection and conservation objectives. An approach to burn scheduling that favours a risk-averse asset protection strategy results in poor conservation outcomes. Conversely, a conservation-focused approach achieves only modest asset protection benefits. However, when formulated as a multi-objective problem, good conservation outcomes can be achieved with only a small reduction in potential benefits for asset protection. Utilising the dry sclerophyll forest ecosystem within the City of Gold Coast, Australia, our conservation-focused approach resulted in substantially more heterogeneity within the ecosystem, which improves ecological integrity, and substantially reduced the area of fire-dependent forest that had exceeded the recommended burn interval. Mathematical optimisation is a powerful framework for informing fire management that improves the prioritisation and scheduling of controlled burns to efficiently achieve management objectives. By quantifying the trade-offs that exist between two competing objectives we demonstrate that compromise solutions can be identified that achieve good outcomes for both objectives. In a transparent and equitable manner, we show that conservation value may be improved within a fire-dependent ecosystem with only modest concession to asset protection performance. Explicitly evaluating trade-offs among competing objectives enables managers to identify potentially undesirable outcomes, and facilitate transparent development of equitable solutions.

SPECIES DISTRIBUTION MODELLING OF IVESIA WEBBERI A. GRAY IN NEVADA AND CALIFORNIA

Temitope Borokini, University of Nevada, Reno, United States; Thomas Dilts, University of Nevada Reno; Peter Weisberg, University of Nevada Reno

Statistical algorithms are used to develop ecological niche models for predicting distributions focal species, for applied management, or to develop hypotheses for further empirical research. In this study, three algorithms–random forest (RF), generalized linear (GLM) and additive (GAM) models–were used to fit distribution models for *Ivesia webberi*, a federally listed rare and threatened species in the western Great Basin Desert, using both presence and true absence points. We compared modeling approaches using linear (GLM) and non-linear (RF, GAM) relationships among predictor and response variables. Selected predictors for the study included 30-year (1981-2010) monthly temperature and precipitation data, digital elevation model (DEM), normalized difference vegetation index (NDVI), solar radiation, soil classes, land cover classes, cover of bare ground, and a species distribution layer for *Artemisia arbuscula*, a species known to broadly co-occur with, and hypothesized to have facilitative effect on *I. webberi*. The variables used for this model fitting encapsulate biotic and abiotic factors and migration (BAM) requirements for determining a species' distribution. Best models were selected using area under curve (AUC) of the receiver's operating characteristics (ROC) plot, Cohen's Kappa, sensitivity, specificity and true statistic skill (TSS). The results show that models fitted with NDVI performed significantly better and explained the highest deviance, compared to models without it. Overall, RF-fitted models indicated that winter temperature, DEM and NDVI were the most important variables for fitting niche models of *I. webberi* accurately. Comparatively, RF and GAM performed better than GLM, but models fitted using RF and GAM were not significantly different. The relative importance of NDVI in these models shows that vegetative community productivity is crucial in predicting the distribution of *I. webberi*.

SPECIES-SPECIFIC BEHAVIOURS IN ANTHROPOLOGICALLY-DISTURBED

LANDSCAPES CAN LEAD SPECIES TO EXTINCTION

Amael Borzee, Seoul National University; Yikweon Jang, Ewha Woman's University

The sixth mass extinction is under way, and amphibians are leading the race. Anthropological elements are frequent factors for threatened statuses (sensu IUCN), and rarely understood as a synergy of species-specific behaviours diverging from their evolutionary purpose. Here, we demonstrate that the endangered Suweon Treefrog (*Dryophytes suweonensis*) is facing aggravated threats in a specific habitat, while the Japanese Treefrog (*D. japonicus*) benefits from it. The two species have access to optimal wetlands for breeding and foraging: rice paddies. These provide abundant nutrients and decreased competition. Besides, agricultural practices are minimally invasive, provide constant flooding, and low predation pressure during the breeding season. *Dryophytes suweonensis* is now found in rice-paddies only, due to its preference shared with primary human tribes for alluvial plain. In today's landscape, it translates by the fragmentation of ranges and genetic isolation of populations. This echoes into a drop-in boldness and dispersion abilities, and a high prevalence for the Chytrid Fungus (*Batrachochytrium dendrobatidis*). Interestingly, all the above are reversed situations for D. japonicus, which is unlikely to be historically present in the habitat. Anthropogenic modifications to the vegetation, in relation to the species habitat preferences, lead female *D. suweonensis* to be amplexed by male *D. japonicus*, which in turns erodes *D. suweonensis* genetic integrity. Besides, the evolutionary justified preference of *D. suweonensis* for calling perches makes it more vulnerable to predation by the introduced American Bullfrogs (*Lithobates catesbeianus*). Finally, agricultural practices are negative for *D. suweonensis* during hibernation due to burning and ploughing, while *D. japonicus* migrates to elevated hills. Thus, the evolutionary meaningful behavioural ecology of *D. suweonensis* is also the reason for its endangered status.

STATISTICAL INFERENCE ABOUT FUNCTIONAL LANDSCAPE CONNECTIVITY FROM TELEMETRY DATA

Jeffrey Royle, USGS Patuxent Wildlife Research Center; Angela Fuller, Cornell University; Chris Sutherland, University of Massachusetts, Amherst

Understanding landscape connectivity is a critical element of conservation and management of rare species and imperiled landscapes, and it can provide important information in the design of corridors and reserve networks. Formal inference about functional connectivity of landscapes requires direct observations of individual movements (or dispersal) and an explicit model of connectivity that links observed movement outcomes to landscape structure. Despite considerable work on analytic methods for modeling animal movement and dispersal, there has been surprisingly little work done on formal estimation of connectivity using such models. Instead, in practice, functional connectivity is often quantified by expert opinion or assumed to be related to measurable quantities such as occupancy or resource selection. Here we develop a statistical framework for formal inference about functional connectivity of the landscape from telemetry data on individual movements. We parameterize a Markovian movement model with an explicit least-cost path model in which "distance" between successive locations is a cost-weighted function of local habitat or other covariates, and also the distance from an individual's home range center. The parameters of this modified least-cost path model are estimated by maximum likelihood. Formal inference about these parameters allows for testing explicit hypotheses about how species interact with the landscape, and thus provides information useful in landscape and species conservation and management. We demonstrate the proposed method using data from a study of black bears (*Ursus americanus*) where we evaluate the effects of forest, agriculture and elevation on functional connectivity.

STATISTICAL MODELLING AND FIELD WORK TO ESTIMATE POPULATION SIZE - CASE STUDY ON DRY FOREST BIRDS

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Species abundance and distribution metrics are cornerstones of conservation planning, for example, in establishing extinction risk and selecting priority areas. However, abundance data are scarce and costly to obtain, especially in comparison to those on species' occurrence. Methods to relate species distribution models (built from presence-only occurrence data) to abundance could bring important benefits for conservation decisions by providing greater understanding of patterns of abundance across species' ranges. Ensemble species distribution models, using four modelling methods, were built for 14 endemics, dry forest bird species, with a median of 150 occurrence records per species, bioclimatic variables and vegetation indices. Field data were obtained on bird abundance and habitat characteristics along four 2.5 km transects at 26 sites in northwest Peru, covering most of the species' ranges. Covariate Distance Sampling was used to estimate bird densities (individuals km-1) at each site using

habitat characteristics and vocalising status as covariates. Relationships between abundance estimates, obtained from the field study, and relative probability of occurrence, obtained from distribution models, were assessed using correlations and modelled using hierarchical logistic regression. Eleven of 14 species showed significant positive relationships between local abundance and modelled occurrence for at least one species distribution modelling method. Population sizes across species' entire ranges were estimated using this relationship. The link between modelled species' occurrence and local abundance is a promising area of research with a view to obtaining better abundance information with less survey effort. Criteria, such as type of predictors, quality of abundance data, quantity of occurrence records, extent of distribution models, and anthropogenic pressures, among others, are discussed in terms of obtaining working relationships between abundance and occurrence.

STORMWATER WETLANDS: VALUABLE HABITATS FOR URBAN CONSERVATION OR ECOLOGICAL TRAPS

Michael Sievers, The University of Melbourne; Robin Hale, The University of Melbourne; Kirsten Parris, The University of Melbourne; Stephen Swearer, The University of Melbourne

Humans are altering ecosystems at faster rates than natural forms of environmental change, affecting both the quality of habitats available to animals and the cues that animals may use to assess quality. As a consequence, habitat selection decisions may be modified, causing animals to maladaptively prefer habitats where their fitness is lower relative to other available options – an 'ecological trap'. The creation stormwater wetlands presents a situation where aquatic animals may select polluted habitats that superficially appear high-quality, but within which fitness is impacted. Despite the risks that such ecological traps could pose to urban biodiversity and conservation, this possibility remains largely unexplored. Using frogs as a model and Melbourne, Australia as a study system, we address four questions: (1.) how does wetland quality vary, (2.) how does wetland quality influence frog fitness, (3.) can frogs recognise and do they prefer high quality wetlands, and (4.) if not, what are the underlying causes? We use Bayesian frameworks to correlate frog presence and richness with comprehensive sediment (e.g., HMs, pesticides) and environmental data. Manipulative experiments with paired high/low quality wetlands reveal that individual fitness (e.g., survival, predator avoidance behaviours) can be severely compromised in polluted wetlands. Coupled with evidence that oviposition site selection does not favour higher-quality sites, we suggest that frogs may be largely incapable of accurately quantifying habitat quality when choosing breeding sites, and provide the first evidence that stormwater wetlands could function as ecological traps. An inability to assess habitat quality may have serious implications for tadpoles as they have a limited ability to move to more suitable conditions. This research has implications for the conservation of a vulnerable taxon within urban environments as well as implications for the authorities responsible for managing stormwater.

SUCCESS OF THREE MARKET-BASED CONSERVATION STRATEGIES

Zuzana Burivalova, Princeton University

The success and effectiveness of different types of conservation interventions is often not well known, because of the complexity of the systems, imperfect implementation, lack of appropriate evaluation, and impossibility to do true experiments. This leaves conservation organizations having to rely of anecdotal evidence, intuitive understanding, or personal preferences. We evaluate three market-based conservation strategies 1) payments for ecosystem services; 2) forest certification; and 3) ecotourism. We focus on cases where these strategies were applied with the goal to protect tropical forests – ecosystems that are crucial in terms of biodiversity, ecosystem services, but at the same time, they are a major source of revenue. Whereas the three conservation strategies have very different mechanisms, they share the hopes for the simultaneous achievement of conservation goals, economic growth, and an increase in human well-being. We synthesize the existing literature to find out to what extent these three market-based mechanisms have achieved their goals in terms of environmental, social, and economic variables. With the caveat that almost none of the existing studies meet the standards for formal impact evaluation, through a qualitative and quantitative review, we found common themes across all the interventions: improvement in environmental condition of the protected forest is typically not equaled by improvements in human well-being and the economic growth is rarely achieved. We identify the most important trade-offs that currently cause conflicting results associated with these interventions, and that, if addressed, would help market-based conservation better deliver the hoped-for benefits.

SUPPORTING THE LANDHOLDERS OF PRIVATE PROTECTED AREAS

Julie Groce, Monash University, Australia; Carly Cook, Monash University

Protection and management of private lands can be integral to effective broad-scale biodiversity conservation. Numerous government- and NGO-led initiatives have been developed to encourage landholders to undertake conservation actions on their properties. Some private land conservation initiatives, such as conservation covenants (or easements), require permanent commitments and on-going land and species management by the landholders. However, little information exists about how these commitments are encouraged, maintained, and translated into on-ground action. We sought to fill this gap by examining conservation covenanting programs in Australia, in which there are over 5,000 covenants covering 4.5 million hectares of land. What motivates landholders to enroll in conservation covenants and continue with management activities? How do they receive information and support for those activities? Are their on-ground actions in line with what is expected by program administrators? To address these questions, we interviewed 82 landholders with conservation covenants across four Australian states, along with 20 staff members who implement covenanting programs. We learned that while landholders and program staff have similar views about the value of covenanting, they have differing opinions about how to achieve conservation of native flora and fauna on the properties. The results of this study add to our knowledge of the ways in which landholder motivations and management actions can be bolstered and sustained, which in turn enables long-term conservation of ecological resources on private lands.

SURFACE WATER DYNAMICS AND LAND USE INFLUENCE LANDSCAPE CONNECTIVITY ACROSS A MAJOR DRYLAND REGION

Robbi Bishop-Taylor, University of New South Wales; Mark Broich, University of New South Wales; Mirela Tulbure, University of New South Wales

Landscape connectivity is important for the long-term persistence of species inhabiting dryland freshwater ecosystems, with spatiotemporal surface water dynamics (e.g., flooding) maintaining connectivity by both creating temporary habitats and providing transient opportunities for dispersal. Understanding how landscape connectivity varies with respect to surface water dynamics and land use is an important step to maintaining biodiversity in dynamic dryland environments. Using a newly available validated Landsat surface water time-series, we modelled 25 years of landscape connectivity between dynamic surface water habitats within Australia's 1 million km2 semi-arid Murray Darling Basin. We identified key habitats that serve as well-connected 'hubs', or 'stepping stones' that allow long-distance movement through surface water habitat networks. We compared distributions of these habitats for low and high dispersal species during dry, average and wet seasons, and within land use types. The distribution of hubs and stepping stones varied spatially and temporally, with temporal changes driven by drought and flooding dynamics. Natural and conservation areas contained higher than expected proportions of both hubs and stepping stones throughout the time-series, however highly modified agricultural landscapes increased in importance during wet seasons. Irrigated landscapes contained particularly high proportions of well-connected hubs for high dispersal organisms, but remained relatively disconnected for organisms with lower dispersal abilities. The habitats identified by our study may serve as ideal high priority targets for management aimed at maintaining or improving dispersal between isolated surface water habitats, potentially providing benefits to biodiversity beyond the immediate site scale. Our results highlight the importance of accounting for spatial and temporal surface water dynamics when studying landscape connectivity within highly variable dryland environments.

SURVIVAL AND GROWTH OF ACROPORA PALMATA IN NURSERY AND TRANSPLANTATION AT COLOMBIAN CARIBBEAN

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In the Caribbean the coral reefs presently show a high degree of deterioration which results in the loss of ecosystem services. Measures implemented to counteract this degradation, such as passive conservation strategies like the creation of Marine Protected Areas, have not been enough to mitigate the deterioration. For this reason, recently it is aimed at the implementation of methods for the purpose of coral restoration. The breeding of coral fragments or establishment of coral nurseries is a strategy that have been used successfully in several coral reefs in the world, to increase the possibilities of conservation and recovery in these ecosystems. The objective of this study was to evaluate the efficiency of the cultivation of *Acropora palmata* fragments in nurseries and its subsequent transplantation to the natural environment. A nursery with 26 tree-shaped structures (coral tree) was installed in the Rosario Islands, where approximately 2600 fragments of *A. palmata* coral were monitored for one year and a small sample is transplanted with plastic devices and marine hepoxical putty to degraded areas of the same species. Survival and growth in terms of linear growth and ecological volume of 50 fragments were evaluated for a period of one year and their subsequent transplantation sites degraded during two seasons: dry and rainy. High

rates of survival and growth were obtained for *A. palmata* in both nursery and transplant, higher than the rates reported in other studies and for the natural environment. The results of this study suggest that both the nursery and transplant methodology for the species used are adequate for the development of projects that promote the restoration of coral reefs in Marine Protected Areas Coastal areas of the Colombian Caribbean.

SUSTAINABLE AGRICULTURE AT A BIOLOGICAL STATION IN THE AMAZONIAN FOOTHILLS

Cecilia Barriga Bahamonde, Asociacion para la Conservacion de la Cuenca Amazonica - ACCA

One of the main threats to the Amazon conservation is the forest conversion to agricultural land. Most of the rainforest soil is extremely poor, low in minerals and nutrients and acidic. This soil needs its vegetation and constant decaying organic material to perform its rapid nutrient cycle. However, the slash and burn agriculture practiced by most farmers does not provide with sufficient organic material to feed the soil, and it will become infertile within a year or two. Regarding at this problem, the third biological station of ACCA, Villa Carmen, was conceived as a research center in tropical conservation and sustainable agriculture. After 6 years of work and research, we analyze of our progress and future steps. The goals of the sustainable agriculture program in Villa Carmen Biological Station are to supply to the station with fresh and high-quality products, to conduct research about the best agricultural practices in the region, and to transmit it. In order to improve soil quality, we built the first biochar kiln in the Peruvian Amazon and start using bamboo biochar to assess its potential in increasing productivity. We are applying different agricultural practices to maintain traditional crops as well as potential new crops for the region. We are also maintaining a national chili pepper germplasm bank and a regional mandioc germplasm bank in our fields. There is still a lot of research to do but we are happy to start watching interest in the local community. Several young students from local institutes will start their practices at Villa Carmen. We see this very optimistic that the experiences at the station will be replicated in the nearby communities.

TARGETING HUMAN CONSUMPTION AND DIETARY CHANGES FOR GLOBAL BIODIVERSITY CONSERVATION

Abhishek Chaudhary, ETH Zurich; Alexander Mathys, ETH Zurich

In addition to traditional interventions such as setting aside protected areas, effective long-term conservation will require complementary socio-economic efforts. This includes reducing the upstream consumption pressures, such as human demand for land intensive food products, which ultimately drive the downstream biodiversity losses. Most previous studies analyzing the nutrient-environment trade-offs have focused either on a particular country, limited number of nutrients (e.g., protein) or selected environmental damage indicators (e.g., GHG emissions). This study aims to investigate whether nutrient and environmental sustainability point to convergent or divergent goals by considering nation-specific dietary patterns, comprehensive nutrient composition of food items and multiple environmental indicators. Particular focus is on assessing the land use (both domestic and abroad) and consequent biodiversity loss associated with diets of different countries. We first assess the nutritional quality of average national daily diet taking into account >25 essential nutrients and several nutrients of health concern in the consumed food items and their daily dietary reference intakes (DRI) and maximum reference values (MRV) respectively. Next, we compile the land use footprint of individual food items through global literature review and translate it to biodiversity footprint (species, range, abundance loss) through recently proposed approaches in life cycle assessment (LCA) literature. Finally, given international trade leads to impacts occurring far away from point of consumption, we employ environmentally extended multi-region input output (EE-MRIO) trade databases to trace the origin and pinpoint the region impacted by importing country and compute the biodiversity costs of national food consumption. Our integrated nutrition-biodiversity assessment of global food systems can provide new insights towards achieving global nutrition, biodiversity and sustainability goals.

TAXONOMIC IMPEDIMENT: A HANDICAP IN INVASIVE SPECIES MANAGEMENT

Joel Chavez, Far Eastern University; Esperanza Arcilla, Far Eastern University; Jose Santos Carandang VI, De La Salle University

Identity of species is a key component in ecological resource management. Establishing the taxonomic background of species targeted in resource management is essential because it can: 1) help diagnose and resolve problems; 2) consolidate initiatives; 3) focus efforts; 4) cut down on budget; and 5) conserve time. Along this backdrop, this paper examines the Philippine experience with two species of fish declared as invasives. First, *Pterygoplichthys pardalis*, or commonly called as suckermouth armoured catfish (SAC), which were first observed in the waters of the Laguna de Bay basin in the late 1990s. The fish was initially identified by Philippine

authorities as *Hypostomus plecostomus*. We studied this fish on the basis of proposing control and mitigating action. If not for the observed inconsistencies in behavior and morphology we found in those studies, we would not have re-identified the fish. Our decision to resolve the fish identity saved us effort, time, money, and discredit to peers. Second, *Monopterus albus* was declared in 2013 by authorities as invasive. Based on our investigation, local encounters were as early as 2011. But a review of the taxonomic record of the fish shows that the first inventory of the species was in 1917. A lot of questions can now be raised because of this finding particularly whether the fish is indeed a non-native species in the Philippines. Following the Convention on Biological Diversity's recommendation to eradicate invasive species, the Philippine government could well be investing in eradicating a native species that has been poorly studied taxonomically. This paper presents these two cases to promote as a necessary step the conduct of taxonomic studies prior to declaring species as invasive—perhaps as a cautious step to an otherwise costly oversight; as well provide an insight how taxonomic studies can be done in the context of a poor or developing nation.

TEMPORAL AND INDIVIDUAL VARIATIONS IN RESOURCE SELECTION OF REINTRODUCED SPECIES: ASIATIC WILD ASS

Miriam Tsalyuk, Ben Gurion University; Shirli Bar David, Ben-Gurion University; Amos Bouskila, Ben Gurion University; David Saltz, Ben Gurion University

Reintroduction of locally extinct species is becoming an increasingly important conservation tool. Understand the movement patterns and resource selection of the species is critical for reintroduction success. However, differences in nutritional and ecological requirements of individuals within a population may drive different response to environmental variables. Moreover, resource selection varies with climate, changing landscapes, and time scales. We examined resource selection of a globally endangered species, the Asiatic Wild Ass (*Equus hemionus*, EH), which was locally extinct and reintroduced to the Negev in Israel. We examined EH movement patterns in response to environmental variables across diurnal and annual temporal variation, and across individual variation (sex and reproductive state). Specifically, we analyzed movement directions and speed as response to climate, topography, vegetation, water, and human disturbance. We marked seven individuals with GPS collars, which recorded location every hour. We used step selection function and logistic regression on speed. EH preferred areas with higher vegetation cover, high precipitation, and closer to water. Females had considerably stronger preference of higher herbaceous vegetation cover than males. Males moved on dirt trails and roads while females avoided it, probably since females are more vigilant. Diurnal variation in resource selection revealed activity patterns of drinking and foraging. Seasonal variation in resource preference showed higher dependency on water and stronger preference of high vegetation cover in the dry season. These temporal variations in resources selection reflected the behavioral patterns and the ecological importance of each resource across seasons. Our results of individual and temporal variation in resource selection emphasize the importance of considering wider range of landscape variables when selecting reintroduction sites and managing resources

TESTING FUNCTIONAL REDUNDANCY AND RESPONSE DIVERSITY AS INDICATORS OF FOREST PRODUCTIVITY RESILIENCE

David Laginha Pinto Correia, Université Laval

The inherent complexity of forest ecosystems subjects forest management to great levels of uncertainty. A promising way of coping with such uncertainty is through the implementation of biodiversity-based ecological resilience forest management frameworks. However, the development of these frameworks is hindered by the lack of real-world studies examining intricate biodiversity-ecosystem functioning relationships. Two possible indicators of ecological resilience have recently received particular attention in the literature: functional redundancy (FR) and response diversity (RD). In this study, we analysed the relationships between pre-logging FR and RD and post-logging productivity in forest sample plots in Quebec, Canada, in order to examine the potential use of FR and RD as indicators of productivity resilience following stand-replacing disturbances. Our analysis revealed that deciduous FR was significantly and positively associated with post-logging productivity, but that coniferous RD was negatively related to it. This negative relationship with post-logging productivity likely results from two factors: (i) the highly destabilizing nature of stand-replacing disturbances, which disrupt complementarity effects that influence RD-resilience interactions; and (ii) black spruce-mediated identity effects. The relatively short time scale of our analyses (10-year post-logging time series) and the use of a single ecosystem function should be taken into account when interpreting our results. Our findings suggest that FR, not RD, is the more robust indicator of ecosystem productivity resilience to severe disturbances within northern temperate and boreal forests. To the best of our knowledge, this is the first study to report a significant negative correlation between RD and ecosystem productivity after a stand-replacing disturbance.

TESTING THE HYPOTHESIS OF CENTINELAN EXTINCTION IN ECUADORS THREATENED COASTAL FORESTS

Nigel Pitman, The Field Museum; Kenneth Feeley, University of Miami; Dawson White, University of Illinois Chicago

Cerro Centinela is a fog-draped 40-km2 ridge in the Andean foothills of coastal Ecuador. The first botanists to visit it in the 1970s -- the legendary plant explorers Alwyn Gentry and Calaway Dodson -- reported a striking flora that included "nearly 100" undescribed and apparently endemic plant species. When the last forests on Centinela were converted to agricultural land in 1988, the ridge became an illustration of how thousands of tropical species with tiny geographic ranges (microendemics) could go globally extinct before being described—an idea popularized by E. O. Wilson's coining of the term 'Centinelan extinction.' Rereading the original reports from Centinela makes it clear, however, that Gentry and Dodson intended their observations of microendemism as a hypothesis to be tested, not as an empirical fact. Over the last two decades many putative Centinelan endemics have been found elsewhere in Ecuador and Colombia, prompting the competing hypothesis that microendemism is largely an artifact of incomplete exploration. Distinguishing between these two explanations is crucial for determining the true scale of global plant extinctions. Here we provide the first comprehensive test of the Centinelan extinction hypothesis, by reviewing the current known geographic distributions of putative Centinelan endemics based on global databases and the plant taxonomy literature. We also analyze climatic patterns, plant collection density, deforestation, and protected areas coverage in western Ecuador to understand how unique Centinela's forests were and to what extent similar sites there have been studied, protected, or destroyed. We find that rates of endemism and apparent local extinction are much lower at the site than originally believed, but still high enough to support the hypothesis of large-scale plant extinctions in tropical mountain ranges.

TETRAPODS ON THE EDGE REFINING PHYLOGENETIC PRIORITISATION TO IMPLEMENT CONSERVATION ACTION

Rikki Gumbs, Zoological Society of London

The alarming scale of the current biodiversity crisis requires effective prioritisation and urgent application of conservation action. The EDGE metric prioritises species based on a score of their Evolutionary Distinctiveness (ED) and extinction risk (Global Endangerment, GE). This metric relies on detailed, recently updated phylogenetic and extinction risk data. We have created lists of EDGE priority species for amphibians, birds, mammals, and reptiles, incorporating species lacking phylogenetic information using a novel imputation method. Further, we have developed criteria to identify robust priority species for all groups in an effort to accurately inform conservation action whilst limiting the impact of phylogenetic uncertainty. Through mapping the global distribution of EDGE scores, we have identified regions of disproportionately threatened evolutionary history. Our updated EDGE prioritisations highlight the impending loss of irreplaceable evolutionary history represented by Madagascan mammals and reptiles, amphibians all across the Western Hemisphere, and unique Asian and African birds. Using both the priority EDGE Lists and regions, the Zoological Society of London's EDGE of Existence programme supports early career conservationists, known as EDGE Fellows, from developing nations to implement conservation projects around the world. Our scientific research is therefore used as the foundation to build capacity in the region, prevent the extinction of species lacking conservation attention, improve ecological knowledge and help to raise awareness of the plight of the most unique and overlooked species on the planet.

THE ARMADILLO CONSERVATION PROGRAM IN THE COLOMBIAN LLANOS: COMBINING SCIENCE EDUCATION AND POLICY

Mariella Superina, CONICET; Alejandra Cortés Duarte, Fundación Omacha; Fernando Trujillo, Fundación Omacha

Successful conservation actions require strategies that combine research, policy formulation and enforcement, and education. The Program for the Conservation of Armadillos in the Llanos of Colombia is a pioneering initiative that addresses these issues in different ways. It was initiated in 2013 and involves a multi-institutional team consisting of a private company, an NGO, academia, government representatives, a zoological institution, and the local community. The main goal of the Armadillo Program is to consolidate efforts that warrant the conservation and management of the populations of five armadillo species in the Orinoco region of Colombia. The development of the first joint action plan of two Colombian environmental agencies allowed establishing armadillos as conservation priorities in the entire Orinoco region, protecting them in an area of 260000 km2. Its main lines of action are being addressed by the Armadillo Program. Scientific research has advanced the knowledge on the ecology and conservation problems of armadillos in the Llanos and resulted in several undergraduate theses and scientific publications. It has also led to the re-categorization of one species in the Red List of

Threatened Species. Private breeding facilities and the zoo rehabilitate confiscated armadillos and carry out ex situ research and environmental education. Regular training is given to staff and students. The Friends of the Armadillos program consists of a network of farms and private natural reserves committed to armadillo conservation, warranting their protection in a total area of about 100 km2. The education programs, exhibitions, school projects, and popular, scientific, and drawing books on armadillos have raised awareness in over 20000 persons. A novel program called "Restaurants free of wild meat" was designed and implemented to reduce the impact of poaching and illegal trade. This pioneering pilot program could be replicated in other areas and applied to other species.

THE BILBI MODELLING FRAMEWORK: PRODUCING A NEW GENERATION OF GLOBAL BIODIVERSITY INDICATORS

Andrew Hoskins, CSIRO; Simon Ferrier, CSIRO; Tom Harwood, CSIRO; Noboru Ota, CSIRO; Justin Perry, CSIRO; Chris Ware, CSIRO; Kristen Williams, CSIRO

Global monitoring of biodiversity status and trends is a critical component in not only the reporting of biodiversity change but also for the strategic deployment of conservation resources. Ideally status and trends should be estimated at spatial scales that are relevant to both ecological processes and the anthropogenic processes that are driving change in the landscape. Here we present the BILBI modelling framework, the engine behind two new global biodiversity indicators – the Biodiversity Habitat Index (BHI) and Protected Area Representativeness and Connectedness Index (PARC). Using community-level biodiversity modelling of species turnover (beta diversity) across a landscape for three separate biological groups (vertebrates, invertebrates and plants) and pairing these with time-series of habitat loss (BHI) or protected area coverage (PARC) we are able to estimate loss (BHI) or level of protection (PARC) for biologically unique environments through time. These estimates can then be used to report progress against Aichi Targets 5 (habitat loss) and 11 (protected areas). By generating continuous predictions across a fine-grained (1 km) grid of the world's terrestrial areas, our new biodiversity indicators are capable of producing results for individual pixels or scaling up estimates to any required level of spatial aggregation above this; e.g., country, region, continent or the entire planet. This talk will focus on the advances in modelling techniques and infrastructure that have enabled establishment of the BILBI framework including the use of a new modified version of Generalised Dissimilarity Modelling for sparse presence-only biological data, advances in model fitting procedures, big-data management, and refinement of environmental covariates, including climate and land use.

THE BIRD-FRIENDLINESS INDEX: A NOVEL METRIC FOR QUANTIFYING THE SUCCESS OF CONSERVATION PROGRAMS

Nicole Michel, National Audubon Society; Curtis Burkhalter, National Audubon Society; Gary Langham, National Audubon Society; Brian Trusty, National Audubon Society; Chad Wilsey, National Audubon Society

Over the past forty years, grassland birds in North America have experienced stronger population declines than any other avian guild, and consequently numerous grassland bird species are now candidates for endangered species listing. From 2008 to 2011, nearly 10 million hectares was converted from grasslands to agriculture in the United States alone. Because 85% of grassland bird habitat is in private hands, the National Audubon Society has developed the Conservation Ranching Initiative, partnering with ranchers to implement management strategies that benefit grassland birds. In order to evaluate the success of our joint efforts, we developed a novel metric to evaluate grassland bird community response to ranching management practices, the Bird-Friendliness Index. The Bird-Friendliness Index was designed to incorporate full suite of species-specific responses to management actions, and be flexible enough to work across broad climatic, land cover, and bird community gradients (i.e., grasslands from northern Mexico through Canada). The Bird-Friendliness Index consists of four components: density estimates of grassland and arid land birds; weighting based on conservation need; a functional evenness metric to incorporate resiliency of bird communities and their ecosystems; and a standardized scoring system to control for interannual variation caused by external factors (e.g., climate, density-dependent cycles). As a case study, we present an analysis of bird-friendliness of conservation ranches as well as private and public lands across the Northern Great Plains region of the United States using the Integrated Monitoring in Bird Conservation Regions (IMBCR) dataset collected by Bird Conservancy of the Rockies. We will demonstrate how this metric enables us to evaluate the impacts of our partnerships on grassland birds, and how it can be adapted for use in a variety of systems.

THE DOMAIN AWARENESS SYSTEM: MODERNIZING PROTECTED AREA

MANAGEMENT WITH CUTTING-EDGE TECHNOLOGY

Kathleen Gobush, Vulcan Inc and University of Washington; Ted Schmitt, Vulcan; Jake Wall, Save the Elephants

Wildlife poaching has intensified in protected areas throughout Africa; in response, frontline managers have identified an immediate need for advanced data systems to support timely and targeted decision-making for disrupting and eventually deterring the threat. Here, we describe the first release of an open-source, extensible conservation technology platform that integrates real-time data generated from communication and tracking devices (e.g., digital radio systems, GPS-vehicle tracking units, aircraft, and wildlife) along with information on security incidents collected through voice communications and mobile field applications into a single operational visualization. The system, the Domain Awareness System, also incorporates continuous algorithm-based analytical capability for wildlife and ranger monitoring and basic reporting and data archiving functionality enabling quick synthesis and dissemination of information. Integration of data and/or images from camera traps, seismic sensors, unmanned aerial vehicles, and other precursor patrol and ecological monitoring data systems, such as SMART, as well as additional mapping and query tools is planned for future releases. Once fully realized, the DAS is expected to revolutionize protected area management practices for collecting and utilizing numerous data streams to make the most informed tactical decisions in near-term as well as adapt team performance to changing threats in the long-term. The development of DAS is user-centered and savanna and forest instances are currently being optimized at several sites on the continent. Sites were chosen on basic criteria related to qualitative measures of threat intensity, governance structure and technological connectivity and capacity. Impact evaluation based on BACI methods and an array of metrics related to interdiction, ranger response time and wildlife mortality is under design and will also be discussed.

THE DRIVERS THAT SHAPE COMPOSITION AND DYNAMICS OF THE PLANT COMMUNITIES AROUND STREET

Machon Nathalie, Mnhn; Mona Omar, Mnhn

Many studies show how quality of biodiversity in cities influences well-being of citizens. Nevertheless, little is known about the drivers that shape it in urbanized zones. Our objective was to determine the factors influencing composition and dynamics of spontaneous vegetation around street trees. The plants of 1,500 tree bases were surveyed annually from 2009 in Paris (France). An analysis of the species distribution showed how the characteristics of the tree bases and the distance to green spaces impact the species richness. The analyses of plant traits showed that the longevity of the seeds in the soil is the main trait that plays a role in the distribution of the species among the tree bases. The results of a software modeling metapopulation dynamics showed that for most of the species, tree bases were sinks for source populations situated in larger green spaces (e.g., parks, stations and river banks) but for some other species, they also participate to the movement of species across the city as stepping stones. The results will find applications in the definition of the best management plans for urban biodiversity preservation.

THE EFFECT OF DUMPING GARDEN WASTE IN WELLINGTONS RESERVES

Miriam Sherratt, Victoria University and Wellington City Council

Exotic weed species pose a serious threat to native biodiversity in New Zealand. The dumping of domestic garden waste appears to be a dispersal pathway for many weed species. However, we lack basic knowledge regarding the magnitude of the problem within Wellington City boundaries. I aimed to clarify the effect of domestic garden dumping on the occurrence and abundance of weed species within reserves. To this end I assessed plant community composition in 17 Wellington City reserves with a history of garden dumping and in 5 reference sites where no dumping had occurred. I found that dumping of garden waste was a significant predictor of the proportional abundance of ground cover weeds. Lower canopy closure was found to be a significant predictor of weed abundance, with shadier sites more resistant to weed invasion. The most common and abundant weeds encountered in reserves were; exotic grass species (20%) and tradescantia (16%). To complement this analysis, I conducted 15 interviews with community members affected by garden waste dumping. Public education was the strategy most frequently suggested by participants as a means of mitigating garden waste. Other suggestions included cleaning up sites, community involvement, fines, garden waste collection, signs and barriers. My study strongly suggests that the dumping of garden waste by residents within Wellington City reserves presents a significant risk to native plant biodiversity in the city, I conclude with a list of recommended actions to combat the problem.

THE FULL AND EFFECTIVE PARTICIPATION OF INDIGENOUS PEOPLES IN FOREST MONITORING FOR REDD+ IN PANAMA

Javier Mateo-Vega, McGill University and Smithsonian Tropical Research Institute; Catherine Potvin, McGill University and Smithsonian Tropical Research Institute

A primary requirement of the climate change mitigation mechanism, Reducing Emissions from Deforestation and Forest Degradation (REDD+), is to calculate emissions factors, i.e., the amount of CO2 emissions or removals per hectare from land use and land-use change, as part of measuring, reporting and verifying (MRV) requirements. Emissions factors are calculated from baseline estimates of the above-ground biomass (AGB) stored in different vegetation types. Ground-based methods for estimating AGB, such as forest inventories, despite being relatively accurate and necessary for calibrating remotely sensed data, tend to be expensive and time consuming. Thus, calls have been made to improve the cost-efficiency of these methods within the context of REDD+. Also, there have been calls for the legitimate inclusion of indigenous peoples and rural communities in various aspects of the mechanism. To address both of these issues, we devised a participatory, rapid, forest inventorying method and tested it across the heterogeneous forest landscape of Darien, Panama. This effort took place within a project that was administratively managed by an indigenous organization working in collaboration with indigenous authorities. A group of 24 indigenous technicians were trained on forest inventorying methods. They established and measured 30 one-hectare plots under our supervision. We tested for various sources of error in tree diameter and height measurements. We also tested the scalability of our tree-level biomass estimates to the plot level by comparing our results with simulations conducted on the Barro Colorado Island 50-hectare plot data. Results indicate that our rapid, participatory, forest inventorying method effectively captures plot-level AGB, while guaranteeing the full and effective participation of indigenous peoples. The benefits of our method in terms of cost-efficiency and access to remote forest areas are discussed, as well as those accrued by indigenous peoples.

THE HIDDEN FACE OF PARROT POACHING: LOCAL DEMAND OF PETS LARGELY OUTNUMBERS TRADE ON PARROTS

Jose Tella, CSIC

International wildlife trade, and to a lesser extent domestic trade, have been recognized as one of the main drivers of population decline for a high proportion of parrot species worldwide. However, little attention has been paid to the impact of parrot poaching not aimed to trade but to satisfy the in-situ demand of pets by local communities. We daily registered over a five-year period the parrots illegally sold in the main Bolivian market at Santa Cruz de la Sierra, recording 7,000-9,000 parrots annually traded from 37 species, and asked to sellers in which municipalities parrots were caught. Then we surveyed 150 of these municipalities for parrot pets, recording ca. 2,000 individuals caught locally from 41 species. On average, only 3 % of the parrots caught were traded to the market, the rest being locally kept as pets by poachers. This renders a minimum number of 1 – 1.5 million parrots caught annually in Bolivia, which largely outnumbers annual illegal domestic trade at the main Bolivian market as well as past international legal trade (180,000 parrots since 1979). Poor keeping conditions and low-quality food provided to locally-kept parrot pets made their median age to death was just 9 months, thus causing a high turnover rate and annual demand of new captures. Interviews to people (n = 300) in a well-represented sample of communities revealed a widespread, long-standing pet tradition. Half of the families had at least one parrot pet, 34% of men had caught parrots in the wild and 47% knew others who also caught parrots, and 34% of their fathers and 13% of their grandfathers also had parrots as pets. The high and widespread local demand of parrots makes difficult to implement policies aimed to halt illegal poaching. Rather, education and awareness campaigns should be mostly addressed to woman and children, since they take care of 85% of pets. Although less detailed, we obtained similar information from Peru, Ecuador and some areas of Brazil.

THE IMPACT OF HUNTING REGULATION DURING THE BRAZIL NUT HARVEST IN THE BOLIVIAS MANURIPI RESERVE

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The Manuripi Reserve is the most important protected area in Bolivia's Northern Amazon, and is home to a diverse and abundant fauna. Brazil nut (*Bertholletia excelsa*) harvest is the main economic activity both for communities and private property owners who live inside the protected area. This activity requires that harvesters remain in the forest for almost three months each year. During this time, they typically hunt wildlife for food, an activity which has had a negative impact on wildlife. To address this problem, in 2008 the Reserve implemented a regulation that controls all activities related to Brazil nut harvest, including establishment of a ban on hunting for temporary harvesters. This study uses the Propensity Score Matching method to analyze the effect that the hunting ban has had in terms of decreasing hunting activities and consumption

of bushmeat among harvesters. We found that the ban has led to a 31% reduction in the number of harvesters who hunt and also reduced the number of animals killed per harvester per day by 65%. Consumption of bushmeat has decreased by 28% among harvesters. Based on the observed reduction in hunting rates, we estimate that harvesters kill approximately 100 animals less per year as a result of the ban. This means that the hunting prohibition, despite not having completely eliminated poaching within the reserve, is contributing to the conservation of wildlife. More broadly, this study provides evidence for the effectiveness of legal mechanisms in achieving conservation objectives in protected areas.

THE IMPACT OF REFORESTATION IN THE CONSERVATION OF ANDEAN FOREST: THE CASE OF POLYLEPIS IN ECUADOR

Maria Segovia, Universidad de las Fuerzas Armadas ESPE

Polylepis, a genus of ca. 28 species, is restricted to the Andean mountain range from 3500 to 5000 m, covering the most important highland ecosystems. Wild populations of Polylepis have been exploited in the Andes as a coal and wood resource for at least 2000 years, to the extent that overgrazing has led some communities to be considered ecologically threatened. *P. racemosa*, a Peruvian species, was introduced into Ecuador in the 1980s as part of a reforestation campaign. Today, it is distributed across the Ecuadorian Andes, even within national parks and protected areas. In this study, the basic information of the introduction of this species was analyzed using cytogenetics, population genetics and morphological analyses. Variation in ploidal level was found using chromosome counts (2n=60, 2n=80) and flow cytometry (2C=2.6388pg-2C=4.658pg) in different Ecuadorian populations, morphological data (stomata and pollen size) and genetic analyses supported these results. Lack of information about the basic systematics, distribution, and requirements of native Polylepis is the main obstacle for a successful reforestation program using any of the native species. Our results confirm the multiple introductions of the non-native species, *P. racemosa*. Although hybridization was not detected, we cannot discount its possible role, given more thorough sampling, or the possibility that it may occur in the near future. Therefore, it is important to analyze reforestation programs in a broader context. Reforestation, conservation, and development projects must take into account the need to create sustainable ecosystems and landscapes as an integral perspective, not an isolated approach.

THE IMPORTANCE OF INCORPORATING REGIONAL VARIATION INTO CONSERVATION PLANNING AND SPECIES MANAGEMENT

Jeffrey Evans, The Nature Conservancy; Kevin Doherty, U.S. Fish and Wildlife Service; Darryl MacKenzie, Proteus Wildlife Research Consultants; Melanie Murphy, University of Wyoming

Understanding spatial patterns and environmental thresholds limiting species occurrence and abundance is a cornerstone in conservation of sensitive species. However, habitat utilization, anthropogenic effects and ecological responses vary in both space and time making small-scale evaluation of species problematic when extrapolating to scales relevant for meeting management or recovery goals. Through a case study of Greater sage grouse (*Centrocercus urophasianus*), we illustrate this issue and demonstrate the limitations of missing ecological context in two disparate portions of the range (core and edge). We model the environmental and anthropogenic effects on species occurrence coupled with a spatial-temporal mixed effect to elucidate a 25-year trend in abundance utilizing a nonparametric method. We identified localized parameters and critical environmental response thresholds for each focal area using parameter selection that accounts for high dimensional interactions and probabilistic response curves. The spatial-temporal model was implemented to understand how the spatial structure of species abundance varied through time. Using these two methods in concert we were able to understand the generalized mechanisms in the spatial structure, temporal cycles and thresholds for each ecological setting. Findings indicate significant differences between the two focal areas in spatial structure, trend in abundance, selected parameters and critical thresholds that indicate site abandonment. Based on our findings we recommend that species management recommendations be based on analysis of variation across the range, modeled explicitly through an experimental design.

THE IMPORTANCE OF LARGE MAMMALS FOR ARTHROPOD CONSERVATION IN TRANSFORMED LANDSCAPES

James Pryke, Stellenbosch University; Francois Roets, Stellenbosch University; Michael Samways, Stellenbosch University

Landscape-scale ecological networks (ENs) are interconnected conservation corridors of high-quality habitat used to mitigate the adverse effects of landscape fragmentation and connect protected areas. Africa's iconic megafauna, like other terrestrial mammals, are in decline due to habitat transformation and fragmentation.

This could lead to cascading effects on ecosystem function and declines in species that interact with these mammals, especially in transformed landscapes. Here, we examine the effect of wild native grazer replacement by domestic stock on butterfly, grasshopper and dung beetle diversity within the ENs of Zululand, South Africa. Insects were sampled in ENs across a landscape mosaic of timber plantations, where 1) wild megaherbivores were maintained, 2) in ENs where these herbivores were replaced by livestock and, 3) in a nearby World Heritage protected area (PA) that has retained its natural complement of megaherbivores and remains untransformed. We compared the effect on dung beetle, butterfly and grasshopper diversity between different grazing stock types (wild vs domestic), between sites located in ENs vs. the PA, in corridors of different sizes, and sites located at various distances from the closest plantation edge. Sites in the PA far from any plantation were similar in composition to those in the wild grazed EN. Presence of the wild grazers was very important for the alpha-, beta-diversity and species composition of all focal insect taxa. This influence was much stronger than whether the sites were in an EN or PA, or any effect from the other variables measured. An assemblage of native large mammals creates a diversity of habitat conditions that improve dung beetle, grasshopper and butterfly diversity. We support the continued use of ENs in production landscapes, and suggest the maintenance or reintroduction of large native mammals into ENs as much as possible to simulate the ecological conditions and natural heterogeneity of nearby PAs.

THE KNOWLEDGE-DOING GAP IN THE GALAPAGOS ISLANDS: INVASIVE SPECIES RESEARCH AND MANAGEMENT

Jaime Ortiz, Cornell University

The "research-implementation" gap has received increasing attention by scientists and educators. To further assess the genesis of this problem it is important to go beyond anecdotal description and provide empirical evidence for the influence of ecological research on environmental management. I used text analysis (probabilistic topic modeling) to compare 50 years of scientific articles, grey literature and management plans to assess the "research-implementation" gap for invasive species management on the Galapagos Islands. My results show that scientists and managers identify the broad issue of invasive species in their writing. However, a closer look to the specific terms used to describe invasive species shows that scientists and managers differ in how they communicate. For instance, the term "alien" was absent from the management plans. Furthermore, the exploration of particular invasive species indicates that there is also a mismatch on species prioritization for research and management. Finally, this empirical evidence shows that only when the broad topic of invasive species is considered, there is a correlation between scientific writing and management plans. Thus, it could be argued that there is a general consensus on the problematic of invasive species, however the divide between research and implementation becomes apparent when specific details need to be worked into resource allocation (i.e., species prioritization). This might suggest that the "gap" is driven by differences in stakeholders' cognitive evaluations (i.e., beliefs, values, attitudes) towards particular species and management programs.

THE MANAGED METAPOPULATION APPROACH FOR CHEETAH CONSERVATION

Vincent Van Der Merwe, Endangered Wildlife Trust

Cheetah (*Acinonyx jubatus*) numbers have decreased across Africa at 2.26% per annum over the past century. Cheetahs occur in 29 subpopulations that have limited connectivity between them. Sixteen populations contain less than 30 animals and, with limited natural dispersal between them, are not viable in the long-term. In South Africa, cheetah numbers are increasing at 2.17% per annum - largely due to the managed metapopulation approach adopted for cheetahs across 53 fenced reserves which has increased both numbers and range. In these reserves, adult cheetahs and cubs have higher survival rates than on unfenced systems in Namibia and the Tanzania. Metapopulation cheetahs occur at some of the highest densities in Africa. Sixteen reserves in countries to the north of South Africa have recently been fenced to reduce human-wildlife conflict. Four of these have requested cheetahs from the metapopulation for restoration, providing opportunities to explore new avenues for the managed metapopulation approach. We acknowledge the limitations of the South African model: it is expensive; 7% of relocated cheetahs die; and natural landscape processes are not always at play. The less managed approach adopted outside of South Africa places a strong emphasis on natural gene flow through the establishment of corridors between conservation areas promoting natural recolonisation. Here we contrast the opposing conservation techniques and their efficacy in light of human population growth and economic development. We discuss whether the managed metapopulation approach will be suitable for creating safe space or simulating gene flow for cheetahs elsewhere in Africa.

THE PAST GUIDING THE FUTURE: A DECADE OF PRIMATE CONSERVATION GENETIC RESEARCH IN GUINEA-BISSAU

Maria Joana Ferreira Da Silva, Porto University, CIBIO/InBIO, CAAP and Cardiff University; Michael Bruford, Organisms and Environment Division, School of Biosciences, Cardiff University; Catarina Casanova, CAPP, School of Social and Political Sciences, University of Lisbon, Portugal; Tania Minhós, IGC, Instituto Gulbenkian de Ciência, Oeiras, Portugal

The study of genetic patterns and evolutionary processes is basal to improve long-term conservation plans. Guinea-Bissau is considered an important biodiversity hotspot in West Africa and a regional refuge for globally threatened species, particularly primates. Increasingly higher levels of anthropogenic-related threats attracted the attention of conservation geneticists and several studies were conducted on Guinea-Bissau primates for the last decade. Here, we compiled and reviewed the research to identify possible common genetic consequences of anthropogenic activities and to suggest upcoming conservation actions. Out of the ten primates recorded for the country, the genetic patterns of *Pan troglodytes verus*, *Colobus polykomos*, *Piliocolobus badius temminckii*, *Papio papio* and *Cercopithecus petaurista* were assessed. Most studies used non-invasive sources of DNA and mitochondrial DNA and microsatellites loci as genetic markers. Estimated levels of genetic diversity were not particularly low but the populations displayed signs of recently altered population genetic structure and disrupted dispersal patterns. Hunting for bushmeat consumption and habitat fragmentation were suggested as the most probable explanations for these changes. Urban primate bushmeat trade has been documented and monitored using both visual and molecular identification of carcasses. Estimates of the number of carcasses suggest a high impact of this illegal activity in wild primate populations. We strongly advice governmental organizations to focus their conservation efforts in assuring functional connectivity between populations, for instance, by maintaining natural ecological corridors between protected areas. The effective control of illegal hunting and deforestation activities in areas not formally protected is of pivotal importance to assure the long-term persistence of primate species in Guinea-Bissau.

THE ROLE OF BIODIVERSITY IN EELGRASS FOOD WEB STRUCTURE AND FUNCTIONING: A MULTIDIMENSIONAL APPROACH

Aaron Eger, University of Victoria; Julia Baum, University of Victoria; Rebecca Best, University of Northern Arizona

There has been a surge of research into the role that biodiversity has to play in sustaining ecosystem function and structure. Past research has focused on a single trophic level, typically primary producers in experimental plots, and has only considered one aspect of biodiversity, typically species richness. To address these gaps, our work aims to examine the predictive power of multiple metrics of biodiversity (including those related specifically to trophic interactions) for determining ecosystem function, here, measured as the biomass of fishes within eelgrass meadows in northern British Columbia, Canada. More specifically, we use taxonomic, functional, and phylogenetic measures of richness, diversity, and evenness to show their relationship with fish biomass. We found measures of richness to have a saturating relationship and measures of diversity and evenness to have a negative relationship with fish biomass. We also use functional diversity traits to test hypotheses related to the dominance of particular species, in addition to overall community biomass. For example, we show how feeding strategies (e.g., passive vs. active) and life history strategies (e.g., body size) are predictors of species dominance across communities. Finally, to investigate the effects of biodiversity across trophic levels, we test whether there is a top-down or bottom up connection between the diversity of the fish predators and the biomass of their invertebrate prey within the same eelgrass community. By researching a community in a real-world ecosystem, this work provides tangible insight into how diversity influences both ecosystem functioning and the community composition of predators and prey. This can ultimately provide guidance regarding what aspects of biodiversity might be prioritized in conservation efforts.

THE ROLE OF COMMUNAL GOVERNANCE IN INCENTIVE-BASED APPROACHES TO COLLECTIVE RESOURCE MANAGEMENT

Tanya Hayes, Seattle University; Felipe Murtinho, Seattle University

In the field of international conservation, Payment for Environmental Services (PES) has emerged as a prominent policy option that is increasingly used by governments and donors to pay communities (not individuals) for the provision of conservation-related activities. To date, however, we have limited empirical knowledge of how PES operates in common-property settings. Of particular concern is how the PES model interacts with communal governance arrangements, and the implications for attaining conservation goals and sustained resource management. The proposed presentation contributes to our understanding of the relationship between communal governance conditions and PES by analyzing the results

from a study of Ecuador's Socio Bosque payment for conservation program implemented on communal lands. First, we identify how a community's governance capacity influences the implementation of PES, specifically focusing on the ability of PES to attain desired behavioral changes, and the communities' abilities to distribute the PES payments. Second, we explore how participation in PES influences collective resource management, namely the development of resource management rules, monitoring, and enforcement activities. The study uses a quasi-experimental design with data from (1) a survey of leaders in 67 communities (44 participant and 23 non-participant); and (2) 420 household surveys. We use logit regression models, bivariate statistics, and qualitative analysis to identify the interplay between communal governance capacity and PES. The findings suggest that PES is more likely to succeed in communities that are organized with previously established resource rules, and that, in turn, PES may serve to further strengthen those institutions. The study also points to how external intermediaries (NGOs, governmental agencies, and scientists) can support communal governance arrangements to further improve the performance of PES in communal settings.

THE ROLE OF REPRODUCTION IN THE SUSCEPTIBILITY OF BACTERIAL INFECTIONS IN A WILD BIRD

Camilo Escallón, Fondo Patrimonio Natural; Lisa Belden, Virginia Tech; Ignacio Moore, Virginia Tech

The microbial communities that reside on animals are dynamic and can be affected by the behavior and physiology of the host. These microbial communities provide critical functions to their host, but can also represent health costs if they are pathogenic. In birds, during the breeding season, there is an increase in physical contacts among individuals, testosterone levels increase in males, and there are additional energetic demands, all of which can increase exposure to bacteria or facilitate infection. As such, we hypothesized that cloacal bacterial communities would be more diverse during the breeding season than in the non-breeding season, that pathogens would be more prevalent during the breeding season, and that individuals would accumulate bacterial species across breeding seasons. We surveyed the cloacal microbial communities in free-living rufous-collared sparrows (*Zonotrichia capensis*) through sequential breeding and non-breeding seasons. We found that the cloacal microbiome was different between the sexes, and that in males, but not in females, the bacterial community became more diverse with the onset of reproduction, increasing its phylogenetic diversity and OTU richness, and then decreased its diversity as they transitioned to a non-breeding condition. Individuals sampled across sequential breeding seasons did not accumulate more bacterial species or change their community composition compared to their previous season. This study showed that the cloacal microbiome in birds is dynamic and that different reproductive stages can have profound effects on susceptibility to infections and their transmission. On a broader scale, understanding the ecological conditions that increase the risk of disease transmission in wild populations should be acknowledged when designing conservation strategies.

THE ROLE OF SHADE COFFEE FOR THE CONSERVATION OF RESIDENT BIRDS

Lina Sanchez Clavijo, Colombia; Nicholas Bayly, SELVA; Pedro Quintana-Ascencio, University of Central Florida

One of the major challenges currently faced by conservation science is finding methods to monitor whether the tools and strategies we have put in place are indeed working towards ecological sustainability. For example, high species richness and abundance have been documented in agroforestry systems but long-term demographic data are required to assess their true value for biodiversity conservation, as intermediately-modified habitats could be functioning as ecological traps, making species persistence uncertain under further landscape and climate change. We used Bayesian population modelling and novel statistical methods to analyze data from seven years of capture-mark-recapture and resightings to compare habitat preference and quality between shade coffee and pre-montane forest for twelve species of resident birds in the Sierra Nevada de Santa Marta (Colombia). We used estimates of occupancy, abundance, site fidelity, seasonal variance in abundance, segregation by age and sex, detectability and habitat switching to classify species according to preference. We used estimates for the effect of habitat on individual body condition, muscle and fat scores, incidence of body and primary plumage molts, breeding activity and proportion of juveniles to classify species according to quality. Six species showed a match between their preferred habitat and the habitat of highest quality, four species showed evidence of preference but no differences in quality, and two species showed a mismatch between preferred and higher-quality habitats. Our results support the importance of: conserving forest remnants in rural landscapes, even for those species classified as habitat generalists; the role of shade coffee as a biodiversity-friendly matrix; and the importance of going beyond species lists and counts by taking behavioral and ecological processes into account when evaluating the contribution of novel habitats to biodiversity conservation.

THE VALUE OF MONITORING AND THE PRICE OF UNCERTAINTY IN THE MANAGEMENT OF AN INVASIVE POPULATION

Ewan McHenry, University of Aberdeen; Thomas Cornulier, University of Aberdeen; Xavier Lambin, University of Aberdeen; David Elston, Biomathematics and Statistics Scotland

Improving decision making regarding resource allocation for the control of invasive populations often requires monitoring to obtain information on the state of the population. The cost incurred by monitoring detracts from the resources available for direct control, and so, for monitoring to be feasible, the information gained must have greater value to management than the costs of obtaining it. We aim to provide generalizable recommendations on the use of monitoring data to inform the management of invasive species. Here we present a simulation study inspired by the control of invasive American mink in Scotland. Mink populations exhibit seasonal dynamics with highly dispersive juvenile and intrasexually territorial adult stages. Control effort was simulated to be dependent on season and perceived variation in the abundance of settled adults. Imperfect monitoring can result in false positive or negative detections of adults, allowing the value of reducing uncertainty by increasing monitoring effort to be explicitly considered in terms of its impact on the invasive population and unplanned overspending of effort budgets. The modelling framework allows the relative value of monitoring effort to be assessed for different control strategies. Future work will utilise large-scale mink control data and surveys of a threatened endemic prey species, the water vole, to estimate the level of mink control required for a high probability of persistence of water vole metapopulations. This will inform future simulation work identifying the balances between monitoring and intervention that maximise the probability of favourable conservation outcomes for fixed cost.

THREAT OR HABITAT? A GLOBAL ANALYSIS OF THE COSTS AND BENEFITS OF AGRICULTURE FOR BIODIVERSITY

Nicholas Macfarlane, IUCN; Thomas Brooks, IUCN; Craig Hilton-Taylor, IUCN; Sara Scherr, Ecoagriculture Partners; Jane Smart, IUCN

The earth is facing its most serious mass extinction crisis in 65 million years, with species loss estimated to be occurring at rates three orders of magnitude higher than background. At the same time the world will require a greater than 50% increase in food production to meet a growing population by 2050. Agricultural production represents both one of the primary drivers of biodiversity loss and an essential habitat for many species. In this context, identifying the appropriate balance and desirable geography between land sparing (high-yield production of agricultural commodities with a small footprint) and land sharing (low-yield production with a large footprint that may maintain some biodiversity) is essential and would benefit from information on the interaction between global extinction risk and agriculture as a threat or habitat. The IUCN Red List of Threatened Species documents extinction risk for species that have been evaluated against the Red List Categories and Criteria. Drawing on the Red List and its Threats (Version 3.2) and Habitats (Version 3.1) Classification Schemes, we analysed the global species threat resulting from non-timber crops, livestock farming & ranching, and wood & pulp plantations as well as the habitats provided by arable land, pastureland, and plantations. This permitted a comparison of the prevalence of threat to species from agriculture with the prevalence of species occurrence in agricultural ecosystems, as well as those both threatened by and living in areas of agricultural production. In addition, we examined variation across habitat type and taxon, and then worked across ecoregions to track spatial variation for both threatened and endemic species. These results provide quantified and spatially explicit data on the interaction between global extinction risk and agriculture that can serve as useful inputs for the land-sparing/land-sharing debate.

THREE CHEAP WAYS OF REDUCING FOREST CARBON EMISSIONS IN TROPICAL ASIA

Victoria Graham, James Cook University; Oscar Venter, University of Northern British Columbia

Every year, millions of hectares of forest in Southeast Asia are logged, burnt and replaced by oil palm and timber estates, as well as infrastructure, in attempts to stimulate regional economic growth. The protection of these forests is of international interest for social and environmental reasons. Paying countries to conserve tropical forests is a promising system for reducing emissions from deforestation and forest degradation in developing countries. However, there is concern that it may be prohibitively expensive given the high revenues from competing industries, particularly the oil palm and timber industries driving rapid forest loss in Southeast Asia. The literature suggests that REDD+ is economically unviable, because the level of finance committed falls short of profits from alternative land-use activities in the region. However, REDD+ can deliver carbon benefits through a wide variety of strategies, not all of which require going head to head with the most profitable industries, including activities that reduce emissions from forest

degradation and illegal deforestation, as well as activities that sequester carbon. Our results offer the first broad comparison of the financial costs and carbon incentives associated with prominent REDD+ strategies in Southeast Asia. We do this by collating financial cost and carbon benefit data from a wide range of sources in the literature. Our results highlight a high level of variation in the cost-efficiency of strategies, and that reducing emissions from deforestation in timber and oil palm concessions are the two most expensive strategies. Based on our results, we advocate an approach that emphasizes collaboration with existing land managers to instil long-term sustainable forest management practices, reduce illegal deforestation and enhance forest carbon stocks. Until carbon finance escalates, we propose three cost-effective ways of reducing emissions.

THREE NEW SURROGATES FOR CONSERVATION PLANNING

Paul Beier, Northern Arizona University; Fábio De Albuquerque, Arizona State University

Given species inventories of all sites in a planning area, several procedures can prioritize sites in terms of the site's complementary value, i.e., the ability of the site to complement (add unrepresented species to) other sites prioritized for conservation. The utility of these procedures is limited because distributions of vertebrates are typically available only as coarse atlases or range maps, and distributions of invertebrates and plants are typically unmapped, whereas conservation planners need to prioritize relatively small sites. We describe three new or recently improved surrogates that can help prioritize sites, namely predicted complementarity (PC, in which species inventory data for a subset of sites in the planning area are used to model complementarity as a function of environmental variables, and the model predicts complementarity for all sites), environmental diversity (ED, which prioritizes the most environmentally diverse sites), and downscaled complementarity (DS, in which complementarity values from large cells are downscaled to small cells, using statistical methods or simple map overlays). Of these 3 surrogates, PC performs best (about 70% efficiency), but may be prohibitively expensive (it requires species inventories from about 20% of sites in the planning area). DS (about 60% efficiency) can be implemented with no data acquisition costs for vertebrates, but cannot yet be applied to plants or invertebrates. ED (about 40% efficiency) has no data acquisition costs, and may be useful to prioritize sites in the face of climate change. We recommend further development of DS and ED, and testing their performance for plants and invertebrates across grain sizes and spatial extents.

TIME-DELAYED RESPONSES TO LAND-USE CHANGES REVEAL A WINDOW OF OPPORTUNITY FOR BIODIVERSITY

Asunción Semper Pascual, Humboldt University; Matthias Baumann, Humboldt UniversityPedro G. Blendinger, CONICET; Pedro G. Blendinger, CONICET; Julieta Decarre, Instituto de Recursos Biológicos, INTA; BIBIANA Gómez-Valencia, Departamento de Ecología, Genética y Evolución, Universidad de Buenos Aires; Tobias Kuemmerle, Humboldt University; Leandro Macchi, CONICET; Matias Mastrangelo, Universidad Nacional de Mar del Plata; Francesco Sabatini, Humboldt Universität zu Berlin

Local extinctions have increased during the last decades and habitat loss driven by land-use change is the main underlying cause for these losses. Nevertheless, uncertainties remain on how species respond to land-use changes. Populations of some species decline immediately following habitat loss, while other species' populations may exhibit a time-delayed response. Such time delays result in extinction debt, defined as the proportion of species predicted to go locally extinct in the future due to past habitat loss. We explored the response of birds and mammals to land-use change in order to identify the presence of an extinction debt in the Dry Chaco, which experienced rapid deforestation for the expansion of cattle ranching and soybean areas. We modelled contemporary (2009-2015) species richness as a function of both contemporary and past (2000 and 1985) landscape patterns. We also identified areas in the Argentinian Dry Chaco where future local extinctions are more likely to occur as a consequence of an unpaid extinction debt. We found an extinction debt for both groups of species: landscape patterns from 2000 explained contemporary species richness better than contemporary landscape patterns. This suggests a time-delayed response of birds and mammals to land-use changes of about 10 years. We found that landscape variables from 2000 were particularly important for forest specialist species. Biodiversity from areas affected by agricultural expansion were likely to experience extinction debts. Contrary, well preserved areas appeared stable showing no future local extinctions. Although extinction debt may remain unnoticed, it is crucial from a conservation point of view since it provides a window of time to counteract future local extinctions by habitat restoration. Our results provide an evidence of an extinction debt in the Argentinian Dry Chaco and therefore it should be included in conservation management to prevent future biodiversity loss.

TRACKING EXPLOITATION IN REEF FISHERIES REDUNDANCY AND SPECIFICITY OF COMMUNITY-LEVEL INDICATORS

James Robinson, University of Victoria; Adel Heenan, Coral Reef Ecosystem Program

Coral reef ecosystems are important fisheries resources for coastal tropical nations. Our ability to track and understand exploitation impacts in reef fisheries requires ecological indicators that link to fisheries properties such as yield or size, respond predictably to environmental variability, and can be quantified in data-poor systems. To date, reef indicators have been used inconsistently between systems, while recent analyses of Seychelles and Indian Ocean reefs suggest that human impacts on indicators may also be region-specific. Consequently, our understanding of redundancy among indicators and indicator specificity to human and abiotic drivers is limited. Using underwater visual census data collected across 38 US-affiliated Pacific islands with diverse exploitation histories, we assessed redundancy among community-level indicators and specificity to environmental drivers. Our set of 11 indicators was informed by established fisheries indicators that respond predictably to exploitation (biomass, mean size, size spectra), as well as new trophic-based system indicators that reflect fundamental properties of marine ecosystems (cumulative biomass ~ trophic level relationships). Size- and trophic-based metrics responded similarly to exploitation pressure, such that populated reefs were characterised by reduced biomass of large-bodied fishes and concentration of biomass in lower trophic levels. Factor analysis revealed that the indicator set was explained by two composite indicators which, when modelled against a suite of abiotic and anthropogenic covariates, were regulated by exploitation pressure (human population density), temperature, and oceanic productivity. Redundancy among size- and trophic-based indicator sets suggests that exploitation impacts may be effectively captured by measuring biomass, size spectra, and cumulative biomass ~ TL relationships. Such indicators are invaluable tools for sustainable regulation of reef fisheries.

TRACKING MEDIUM-TERM IMPACTS OF CONSERVATION PROJECTS ON HUMAN WELL-BEING IN NORTHERN CAMBODIA

E.J. Milner-Gulland, University of Oxford; Emilie Beauchamp, University of Oxford

The success of conservation interventions often depends on the multifaceted and sometimes competing interests and motivations that lead local people to sustainably manage natural resources in the first place. Yet despite an extensive literature exploring the effects of conservation on human livelihoods, there is a lack of robust evidence about which type of conservation intervention works, for whom, and how. This is partly because the social impacts of conservation often affect multiple aspects of human well-being, with changes taking place over long periods during which unintended feedbacks can occur. I will present results from a mixed methods assessment of medium-term impacts of Protected Areas (PAs) and of three Payment for Environmental Services (PES) projects on well-being indicators across 16 villages in Northern Cambodia. This multi-period evaluation combined three panel surveys over six years from villages inside and outside PAs with qualitative insights investigating impacts on local well-being to clarify the mechanisms through which social effects of conservation take place and how this translates into the development pathways adopted by households. I will demonstrate that while livelihood improvements were recorded across all villages, we found that PAs slightly reduce households' rate of change, yet without impeding development. Participants in one of the three PES projects improved their economic status and agricultural productivity at a significantly greater rate than non-participants, suggesting that there can be important social co-benefits to conservation interventions when programmes are well-designed to respond to local contexts. I'll expand on suggestions for successfully sustaining PES programmes in the long-term, notably increasing village-level institutional capacity-building, implementing pro-poor inclusions, and using new methods beyond matched designs to gain further insights into the dynamic nature of conservation impacts.

TRADE OF MARINE TURTLES IN THE GULF OF VENEZUELA: ONE PROBLEM, THREE NATIONS

Hector Barrios-Garrido, Mr; Ninive Espinoza-Rodriguez, Grupo de Trabajo en Tortugas Marinas del Golfo de Venezuela; Mark Hamann, James Cook University; Maria Montiel-villalobos, Instituto Venezolano De Investigaciones Cientificas, ivic; Jordano Palmar, Grupo de Trabajo en Tortugas Marinas del Golfo de Venezuela; Daniela Rojas-Cañizales, Grupo de Trabajo en Tortugas Marinas del Golfo de Venezuela; Natalie Wildermann, James Cook University

Marine turtles play an important role in the culture and economy of numerous coastal communities around the world. However, the legal framework that regulates the consumptive use of these reptiles varies among countries. Although marine turtles species are protected in many Caribbean countries, use is controversial, and illegal use in the region has been documented. For example, despite it being illegal to sell and consume marine turtles in Venezuela, the consumption of marine turtles has

been regarded as common in several rural areas of the country, especially in the eastern coast of the Guajira Peninsula (Western Venezuela). In order to assess the scale and magnitude, and cultural component of this use, we interviewed 35 residents from the southwestern coast of the Gulf of Venezuela (Venezuelan part of the Guajira Peninsula), using a combination of in-depth and semi-structured interviews. In addition, we carried out field and detailed market-based observations on the Guajira Peninsula to detect the sale and use of marine turtle products. We focused on three main categories of use; the type of product, routes of trade, and the price of products. We found that all of the marine turtle species reported from the Gulf of Venezuela were used, and the prices of products varied among their type, species of origin, and the distance from the capture area to market place. Also, we obtained evidence connecting Wayuú Indigenous people's traditions and beliefs with marine turtle use. In particular, we found that marine turtles are commonly used as traditional products such as medicine, and as an economic resource to sustain their communities. It is probable that trade of marine turtle products is placing pressure on marine turtle populations in the Gulf of Venezuela. We recommend the implementation of an inter-institutional conservation-portfolio be developed for the Peninsula to evaluate further actions related to this concern.

TRADITIONAL KNOWLEDGE AND SOCIAL BENEFITS IN PACIFIC HERRING MANAGEMENT THE OCEAN MODELING FORUM

Tessa Francis, University of Washington Tacoma; Phillip Levin, The Nature Conservancy

Pacific herring range in the North Pacific Ocean from Alaska to California and play important roles as a fisheries target and prey for birds, mammals, and other fishes. They are also cultural keystone species for a number of indigenous communities. Herring populations are naturally highly variable and have also been greatly affected by human stressors including fishing, contaminants, and oil spills. Many herring fisheries have been closed or severely limited through much of their range for more than a decade. Evaluating management strategies for herring fisheries is hampered by a poor understanding of the factors affecting herring productivity, poor forecasting by stock assessment models, and the lack of a social-ecological framework that would facilitate the integration of traditional knowledge and cultural ecosystem services into fisheries management decision-making. Here we present preliminary results from a working group convened by the Ocean Modeling Forum, including modelers, empiricists, managers and representatives of indigenous and commercial fishing communities, to evaluate the social, cultural and ecological consequences of herring fisheries by using multiple models and diverse knowledge streams, including traditional ecological knowledge. In a comparative framework we also assess the important role of spatial scale in evaluating tradeoffs between social, cultural and economic services provided by herring in Haida Gwaii, British Columbia (Canada) and Sitka, Alaska (USA). We will discuss how the Ocean Modeling Forum framework can be applied across ecosystems and management issues.

TRANSLOCATION OF HAWAIIAN SEABIRDS TO HIGH ISLANDS TO MITIGATE EFFECTS OF CLIMATE CHANGE

Eric Vanderwerf, Pacific Rim Conservation; Megan Dalton, Pacific Rim Conservation; C. Robby Kohley, Pacific Rim Conservation; Lindsay Young, Pacific Rim Conservation

The most serious long-term threats to birds nesting on low-lying oceanic islands are sea level rise and increased storm surge associated with global climate change and introduction of non-native predators. The Northwestern Hawaiian Islands (NWHI) support some of the largest tropical seabird colonies in the world and the majority of the global population of several seabirds, and are part of one of the largest marine protected areas, but most of the islands are atolls < 5 meters high and are already losing land area. We are attempting to mitigate the threat of climate change on vulnerable seabirds by translocating chicks to areas of managed habitat on higher islands in the Hawaiian Archipelago. Many of these seabirds formerly nested on the higher islands but were extirpated centuries ago by non-native predators introduced by humans. They are unlikely to recolonize these islands without assistance because their closest existing colonies are distant. Our goals are to protect a similar amount of habitat that is being lost in the NWHI, and to create new colonies that are secure from predators and sea level rise for all seabirds that nest primarily in the NWHI. We have constructed three predator exclusion fences thus far, on Oahu and Kauai. In 2014-2015 we translocated 30 Laysan albatross chicks to a 16-acre predator exclusion fence at James Campbell National Wildlife Refuge on Oahu, of which 29 fledged. In 2017 we moved 15 Black-footed albatross chicks from Midway Atoll to Oahu, and in 2018 we plan to move Bonin Petrels from Midway, with additional species from Midway and Tern Island in subsequent years. Seabirds have high site fidelity, and we expect the chicks raised during this project to begin returning to their release sites in 3-5 years and to start nesting there in 5-9 years. The methods we are developing for translocating and rearing

seabirds will be useful for similar projects involving other species.

TREE DIVERSITY PATTERNS AND CONSERVATION PRIORITIES IN CENTRAL-NORTHERN SOUTH AMERICAN DRY FORESTS

Karina Banda R, Royal Botanic Garden Edinburgh/ Fundacion ESC

Tropical dry forest has been considered one the most threatened tropical forests worldwide. Conservation efforts have been insufficient, for example in Colombia the remaining dry forest covers only 8 % of its original extent. This study aims to identify floristic affinities and diversity patterns of Central American and northern South American seasonally dry tropical forests and to frame their conservation prioritization in a regional context. Classification methods were used to analyze 113 areas in this region from the DRYFLOR database that include 1725 species of trees, finding ten floristic groups. Prioritization of conservation actions usually requires a huge amount of detailed information that is not available for tropical species. So, it is necessary to find a balance amongst rigour, feasibility, and cost-effectiveness. In this context, numerical analyses of specimen and inventory data can be used for assessing conservation priorities. We assessed two quantitative indices to assess the priority conservation value of dry forest groups in the region, i. Genetic Heat Index (GHI) as a measure of global rarity, and ii. a new Conservation Priority Index (CPI) which includes diversity metrics (alpha and beta diversity), endemism, and threats. Results of the two indices were significantly different, and due to the valuable information that both supplied, we suggest a modified CPI where the weight of the endemism parameter is doubled. According to this modified CPI, conservation should be focused on the South American Caribbean Coast, inter-Andean Valleys and in the Llanos dry forests. A biogeographical approach should be used as a framework for conservation planning, and furthermore, binational initiatives are urgently needed between Colombia and Venezuela. These should include a regional protected areas network across political borders, with the aim to promote the connectivity and preservation of the dry forest remnants and the appropriate management of land.

TREES NOT PATCH SIZE DRIVE BIRD COMMUNITY IN A LOW-INPUT AGRO-ECOSYSTEM IN AN ANTHROPIZED LANDSCAPE

Eric Mellink, Centro de Investigación Científica y Educación Superior de Ensenada; Melinda Cárdenas-García, Centro de Investigación Científica y Educación Superior de Ensenada; Mónica Riojas-López, Universidad de Guadalajara-CUCBA

One of the most typical agro-ecosystems in the Llanos de Ojuelos, a semi-arid region of central Mexico, is that of fruit-oriented orchards of nopales (prickly pear cacti). This perennial habitat with complex vertical structure provides refuge and food for at least 112 species of birds throughout the year. Nopal orchards vary in their internal structure, size and shrub/tree composition, factors with unknown effects on the birds. To further understand the conservation potential of this agro-ecosystem, we evaluated the effect of patch-size and the presence of trees on bird community composition. Community composition was obtained through a year of census transects in 12 orchards. The presence of trees in the orchards was the major driver of bird communities followed by seasonality; bird communities are independent of patch size, except for small orchard patches that benefit black-chin sparrows, considered a sensitive species. At least 55 species of five functional bird guilds used the orchards. Orchards provide adequate habitat and food resources for several sensitive species of resident and migratory sparrows. The attributes that make orchards important for birds in our study: trees, shrubs, herb seeds, and open patches can be managed to maintain native biodiversity in a highly anthropized region with an urgent need for finding a convergence between production of goods and biological conservation.

TROPICAL ANDES PROTECTED-AREAS A LARGE UNEQUAL EXPANSION THAT NEEDS TO ACCOUNT FOR CLIMATE CHANGE

Javier Fajardo, Real Jardín Botánico of Madrid; Elisa Bonaccorso, Universidad San Francisco de Quito; Christian Devenish, Manchester Metropolitan University; Ángel Felicísimo, Universidad de Extremadura; Janeth Lessmann, Pontificia Universidad Católica de Chile; Rubén Mateo, University Polytechnic of Madrid; Fernando J. M. Rojas-Runjaic, Museo de Historia Natural La Salle; Haidy Rojas, Instituto Venezolano de Investigaciones Científicas; Miguel Lentino, Colección Ornitológica Phelps; Jesús Muñoz, Real Jardín Botánico of Madrid

Tropical Andean countries have made a notable effort in expanding their protected area (PA) networks in the last few decades. These networks have moved from their almost non-existence in the 50s, to their current configuration, that covers a ~15% ± 2% of the countries' surface. However, the incorporation of reserves to the networks has not always followed a systematic and informed plan, which could have resulted in an irregular protection of species across taxa that might not be well suited for their conservation under climate change. We

evaluated, on a yearly basis, how the enlargement of tropical Andean PA networks has translated into species conservation, considering their present and predicted future distributions. For this, we built ensemble distribution models for 3,078 vertebrate and 9,304 plant species and projected them to two scenarios of climate change (RCPs 4.5 and 8.5). Then, we compared the rates at which species conservation goals (10% of their distributions within PAs) have been met. We found that birds, followed by mammals and amphibians, have benefited from the addition of PAs at a faster pace than reptiles and plants, whose conservation goals achievement was satisfied a 35% more slowly. Worryingly, the networks' conservation gaps for species under climate change are not only twice as high as those for present distributions, but also the rate at which they have been filled up is only one-third the present's rate. The data also unveils a tipping point in the last decade when the effectiveness of incorporated areas peaks, perhaps as a result of enhanced planning. Our results contribute to better understand the growth of tropical Andes conservation networks, emphasizing the demand for their further expansion, and the need to account for climate change when planning which areas to incorporate in the future.

TWO DECADES EVALUATING RISK OF EXTINCTION: VENEZUELA IN THE LATIN AMERICAN CONTEXT

Ariany Garcia-Rawlins, Provita; Jesus Morales-Campos, Provita; Jon Paul Rodriguez, IUCN SSC, Provita, Instituto Venezolano de Investigaciones Científicas

For over 50 years, the International Union for Conservation of Nature (IUCN) has assessed species' extinction risk on a global scale. The American continent holds over 40% of countries considered to be megadiverse. National Red Lists (NRL) based on IUCN's regional guidelines provide ideal data to report and compare the status of species between countries, as well as their progress towards achieving goals and defining national conservation priorities. In South America, the generation and updating of NRLs covers over 80% of countries, contrasting with the Caribbean where the percentage is lower. The importance of NRLs increases as periodic re-assessments allow for the calculation of the Red List Index (RLI) to monitor changes in species' status over time. Venezuela stands out in the region with four faunal assessments since 1995 and RLI for amphibians, birds, fishes, mammals and reptiles, showing that amphibians have the worst and more rapidly declining status. To date, 52 NRL have been published in the region, but only 29 comprise more than one taxonomic group. The first Latin American NRL were published at the end of the 1980s and have been increasing in number during the last three decades. There are still information gaps to fill, however, which makes it necessary to continue promoting training and assessments, and more importantly to design and implement conservation actions based on the information available in NRL. Venezuela is currently in this stage, creating a perfect opportunity to go beyond assessment of extinction risk and translate the scientific effort into effective actions to conserve biodiversity.

UGLY AND POOR: THE CONSERVATION OF UNCHARISMATIC ANIMALS IN UNDEVELOPED COUNTRIES

Cristhian Clavijo Romero, Museo Nacional de Historia Natural; Romi Burks, Southwestern University, Georgetown, Texas

Successful conservation efforts emerge from an intersection between knowledge, care and value. With thousands of species described each year, invertebrates overall represent a poorly known, yet diverse group worldwide. Our knowledge about the majority of invertebrate species does not come close to reaching the understanding needed to develop programs for effectively conservation. Driven to contribute to the good of society, conservation nevertheless requires many resources and time, money and logistical help often remain scarce. Especially in the undeveloped countries, the use of funds for conservation projects commonly gets perceived as a loss of resources to palliate problems considered much more important. This perception leads to discussions within the communities about the use of founds for conservation, especially in countries with more scarce resources and potentially larger environmental problem. This talk will use freshwater molluscs as a case study to show ways in which biologists can combat this bias and increase the public's perception of the value of conservation. In this context, the conservation of invertebrates in undeveloped countries depends on innovation. An important strategy includes showing the public, managers and politicians that the conservation of uncharismatic animals (i.e., mostly invertebrates) can directly relate with problems like hungry, poverty, health. Such a strategy also helps to build networks between scientists to enhance research actions. In particular, it is crucial to understand and to communicate that invertebrates hide ecological services, process and substances that can collaborate in the resolution of main problems of the undeveloped countries. We have the opportunity to develop a toolbox to improve invertebrate conservation through the empathy and curiosity.

UNDERSTANDING HUMAN-WILDLIFE CONFLICT: LESSONS FROM CASE STUDIES ACROSS THE JAGUAR RANGE

Alexandra Zimmermann, Oxford University

Human-wildlife conflict affects an alarming number of threatened wildlife species and often severely impacts the well-being of the people of whom we ask support for wider conservation goals. There are immense challenges in addressing HWC around the world, in particular because the underlying cultural, political and economic aspects that shape these conflicts at their roots are often poorly understood. For example, throughout their range, jaguars are persecuted for killing livestock, which is a wide-spread and serious threat to the species' survival. These conflicts vary in their characteristics and levels of complexity and often obscure deeper socio-political issues which may considerably hinder conservation efforts. We conducted seventeen case studies in seven countries in order to identify any patterns which might allow us to improve the challenge of managing human-jaguar conflict across the range. This study illustrates a very large variety of geographic, agronomic and socio-economic contexts, within heterogeneous communities, different farm types, varying extents of losses to jaguars, economic dependency on livestock and education levels. Both within and across the case studies there were considerable differences in farmers' experiences with livestock losses, concerns about depredation, levels of tolerance and attitudes, as well as social norms towards jaguars in each community. However, none of the situational factors alone could be used to predict how farmers perceive jaguars and deal with depredation. Instead, each case is highly unique and varied in its complexity. Tools for understanding such complexity are described, considering factors such as the limits of practical interventions such as livestock husbandry improvements, as well as approaches to addressing the history of conflict or reconciliation of even more deep-rooted values and social norms that affect communities' responses to jaguar depredation.

UNDERSTANDING NANUK POLAR BEAR FOR ITS CONSERVATION IN NUNATU KAVUT AND RECOVERY IN CANADA

Patricia Nash, NunatuKavut Community Council

In Newfoundland and Labrador, Canada, the polar bear (*Ursus maritimus*) was listed as Vulnerable under the Endangered Species Act since 2002, and was later designated as a species of Special Concern in 2011, under the Canadian Species at Risk Act (SARA). In Newfoundland and Labrador, polar bears are found along the Northern Labrador coast, moving in the winter to southern Labrador (NunatuKavut). Polar bear found in Labrador are part of the Davis Strait subpopulation. The southern Inuit of Labrador have a special relationship with polar bear in NunatuKavut, and their knowledge is critical to protecting and conserving polar bear in Labrador, and Canada. This Indigenous knowledge (IK) however, has not been recognized or valued by governments in decision-making. The NunatuKavut Community Council's goal was to document the role polar bears play in southern Inuit culture, current knowledge, and the important contribution of IK to polar bear conservation. In collaboration with university researchers, twenty Elders and other knowledge holders in NunatuKavut were interviewed, to collect information on polar bear biology, weather, ice, seals, and hunting. Data was analyzed to identify cultural connection, environmental factors impacting polar bears, and changes in human-bear interactions. The results are expected to be incorporated into the new Provincial Polar Bear Management Plan, as well as the new Federal Polar Bear Management Plan, both to be completed in 2017. An educational poster was also developed on polar bears in NunatuKavut, and polar bear safety workshops were held in southern Inuit coastal communities. The research and outreach activities will contribute to polar bear conservation in NunatuKavut, and globally.

UNDERSTANDING ROADS AND THEIR BUFFER AREAS TO EVALUATE THE CREATION OF BIOLOGICAL CORRIDORS

Santiago Espinosa, Universidad Autónoma de San Luis Potosí; Pablo Medrano, Pontificia Universidad Católica del Ecuador; Gorki Ríos, Pontificia Universidad Católica del Ecuador

Biological corridors are a key conservation strategy because they can increase effective population sizes by facilitating animal dispersal between different conservation units. In some circumstances, biological corridors need to include areas where pre-established infrastructures such as roads, that hinder animal dispersal, exist. Moreover, frequently land cover along road margins are not natural and can constitute an additional barrier for animal dispersal. We explored the effect that roads and their buffer areas may have on the connectivity of animal populations between three protected areas located in the eastern slope of Ecuador's Andes —Cayambe-Coca National Park, Sumaco-Napo-Galeras National Park, and Antisana Ecological Reserve—. Our study objectives included: 1) to explore landscape attributes associated with higher mortality on roads, and 2) to identify best corridor alternatives to connect the three protected areas. Our methods included a systematic survey of road kills, camera-trap surveys to

evaluate wildlife occurrence, and the development of circuit models to identify potential corridors. We surveyed 7128 km of roads in 72 days where we found 452 road kills. Distance to remnant vegetation was the most important variable to predict mortality of birds, reptiles and mammals, while distance to rivers and ravines was important in predicting amphibian mortality. Among the species detected by camera traps in areas near roads were little red brocket *Mazama rufina*, mountain tapir *Tapirus pinchaque*, oncilla *Leopardus tigrinus* and Andean bear *Tremarctos ornatus*, animals with large spatial requirements which should be more sensitive to isolation. Best possible areas for establishing biological corridors in our study area were those with higher proportion of natural habitat. With our study we provide evidence of the importance of managing small remnants of natural vegetation that can function as stepping-stones to increase connectivity of protected areas.

UNDERSTANDING THE DRIVERS OF POPULATION CHANGE IN TWO SYMPATRIC PRIMARY CONSUMERS

Katie Hooker, University of Florida; L. Conner, Joseph W. Jones Ecological Research Center; Robert McCleery, University of Florida; Gail Morris, Joseph W. Jones Ecological Research Center; Theron Terhune, Tall Timbers Research Station

Interspecific interactions such as competition and predation drive community composition as described by classic niche, coexistence, and competition theory; however, these theories lack strong empirical support, especially in multi-predator, multi-prey ecosystems. Cotton rats (*Sigmodon hispidus*) and Northern bobwhite quail (*Colinus virginianus*) are ubiquitous primary consumers throughout their geographic ranges. They overlap in their food preferences, nesting material, and microhabitat, and their populations follow similar long-term fluctuation patterns. One potential explanation for this pattern is the alternative prey hypothesis where cotton rats serve as buffer prey for quail predators. We investigated the mechanisms of cotton rat and quail population fluctuations to determine if these co-occurring primary consumer populations are driven by resource limitations. We analyzed long-term datasets of summer cotton rat density from mark/recapture studies and autumn density of Northern bobwhite quail. We hypothesized that primary consumer populations respond to annual environmental variation in key variables including rainfall, temperature, and annual net primary productivity. Our preliminary results show a strong relationship between Northern bobwhite quail density and precipitation, while cotton rat density demonstrated a delayed response to fluctuations in annual precipitation. This variable response to precipitation may indicate a greater sensitivity of Northern bobwhite quail to environmental variation or perhaps is the result of the variation in life history strategies of these species. Understanding the drivers of primary consumer coexistence on a local scale across a geographical region will inform ecosystem management and provide empirical support for a number of classic ecological theories.

UNLEASHING THE DEVIL IN THE GARDEN OF EDEN

Vince Scoleri, University of Tasmania

In response to Devil Facial Tumour Disease (DFTD), a number of Tasmanian Devils (*Sarcophillus harasii*) were introduced to Maria Island to establish a wild population of free-living animals. Maria Island, often referred to as Tasmania's Eden, has seen multiple vertebrate species introductions over the past 50 years including cats (*Felis cattus*), black rats (*Rattus rattus*), house mice (*Mus musculus*) and herbivores such as wallabies, wombats (*Vombatus ursinus*), and brushtail possums (*Trichosurus vulpecula*) that have all contributed some top-down influence on the island's fauna and flora. We measured the effects of the introduced Tasmanian Devil, on the total and species-specific predation pressure on the short-tailed shearwater colonies (*Puffinus tenuirostris*) from 2012-2016. Camera surveys monitored changes in predator activity and quantified predation events while burrow occupancy surveys monitored chick survival. We found that devil introduction altered the total predator dynamics on the colonies with devils having significant impacts on feral cat and brushtail possum activity. Shearwater burrow occupancy varied significantly over the years but no chicks successfully fledged in the last two years of this study due to increased predation by devils. This bold conservation strategy has been highly successful in conserving the future of the Tasmanian Devil and our results aim to increase our understanding of the Tasmanian Devil's role in structuring ecosystems and its potential to limit feral cats and other herbivores. While this introduction may have come at a small cost resulting in the local expedition of a seabird species, it is important to note that the overall future of the species in the region remains secure.

UNPACKING CHANGES IN MANGROVE SOCIAL-ECOLOGICAL SYSTEMS: LESSONS FROM BRAZIL, ZANZIBAR AND VIETNAM

Claire Quinn, University of Leeds; Lindsay Stringer, University of Leeds; Rachel Berman, University of Leeds; Flower Msuya, Institute of Marine Sciences, IMS, University of Dar es Salaam; Steven Orchard, University of Leeds; Juarez Pezzuti, Centre for Advanced Amazonian Studies,

Federal University of Parà; Hue Thi van Le, Vietnam National University

Mangroves provide multiple benefits, from carbon storage and shoreline protection to food and energy for natural resource-dependent coastal communities. However, they are coming under increasing stress from processes such as climate change, coastal development and aquaculture. There is a growing need to better understand the changes mangroves face in order that they can be better managed. By identifying whether these changes and the responses to them differ or are similar in different parts of the world, valuable lessons can be identified and shared between locations. Using a multiple case study approach focusing on Vietnam, Zanzibar and Brazil, this research analyzed the drivers, pressures, states, impacts and responses (DPSIR) of mangrove systems. Qualitative content analysis was used on a purposively sampled document set for each study country (covering the period 1984-2013) to identify and collate evidence for each of the DPSIR categories. Population growth and changing political and economic processes were key drivers across the three countries, leading to land use change and declining mangrove states. This had an impact largely on the delivery of regulatory and provisioning ecosystem services from mangroves and on the welfare of coastal communities. Responses have been predominantly regulatory and aim to improve mangrove states, but without sufficiently considering the trade-offs between ecosystem services and welfare. Scale emerged as a critical factor, with drivers, pressures, impacts and responses operating at different scales (from international to local). Current responses are too focused on addressing local scale impacts. Findings suggest that responses need to better target larger-scale drivers and pressures, not only to mitigate declining mangrove states or enhance those that are improving, but also to tackle the root causes of negative changes to mangrove systems.

UNRAVELLING HUMAN-CARNIVORE CONFLICTS THROUGH ECOLOGICAL AND MANAGEMENT FRAMEWORKS

Darío Moreira-Arce, Facultad de Ciencias, Universidad de Chile; Javier Simonetti, Facultad de Ciencias, Universidad de Chile; Javier Simonetti, Facultad de Ciencias, Universidad de Chile; Carolina Ugarte, Facultad de Ciencias, Universidad de Chile

Predation of domestic animals by carnivores triggers human–wildlife conflicts across production-oriented landscapes. Resolving this conflict requires ecological and management frameworks to identify those factors that increase predation as well as management techniques that can reduce domestic animal losses. Using a global literature review, we compiled published data on domestic animal predation to analyze ecological factors related to this phenomenon and to assess the effectiveness of management techniques used to reduce it. Carnivores more often involved in predation exhibit larger home ranges while showing larger reduction of their distribution ranges (rho 0.64 and 0.56, $p<0.01$). Predation was positively related to vegetation cover ($t = 35.8$, $p < 0.01$), whereas it seems to be negatively related to distance to forest ($t=2.0$, $p=0.1$). Predation is higher in dry season ($t = -2.2$, $p = 0.05$) and occurs similarly at day and night ($t=1.2$, $p>0.05$). Lethal control was frequently used by producers (42.5% of evaluated cases) compared to non-lethal techniques. Quantitative measurement of animal losses with/without a particular technique indicates that lethal control and night confinement do not reduce predation ($-1.78 < t < -0.34$, $p > 0.05$). On the contrary, predation was on average 2.3,1.4 and 1.7 times lower in cases where livestock-guardian dogs, fencing and the use of herdsmen were applied ($t = -3.12$, $p < 0.02$; $t = -3.31$, $p < 0.02$ and $t = -2.34$, $p < 0.05$). While carnivores' ecological attributes do increase the likelihood of a species to be considered "conflict-prone", domestic animal predation is also affected by seasonal and landscape-level variables. Non-lethal approaches are called to prevent domestic animal losses at the same time of promoting the conservation of carnivores in production-oriented lands. Quantitative evaluation of the effectiveness of non-lethal approaches will be to demonstrate the success of them as tools for informed conservation decision-making.

URBAN ELEMENTARY SCHOOL GARDEN IMPORTANCE

John Cigliano, SCB Citizen Science Working Group; Amy Goodall, James Madison University

James Madison University Geographic Science (JMU GS) students implemented a garden at a Harrisonburg, Virginia elementary school during spring 2012 in order to build a living laboratory for urban students and to provide a study site for undergraduate research of insects. Garden plantings were selected based on literature review of native plant species and a poll of elementary student preferences for vegetables, fruits, insects, and birds. After five growing seasons and regrouping on garden management each year, a garden culture has developed between the elementary school and the JMU GS Program. The garden program currently involves collaboration between undergraduate volunteers for garden care and elementary teachers that use the garden for teaching students from over 40 countries of birth. Along with educational benefits about place-based vegetable and fruit growing, the garden also has important implications for insect biodiversity. According to

four years of undergraduate research, the school garden has the highest butterfly biodiversity when compared to five other Harrisonburg city green spaces. This presentation summarizes the value of the garden program to the environment and to student learning and career development. Included is an assessment of four years of butterfly surveys conducted by undergraduates, a review of participation by elementary students in garden activities, and an evaluation of the number of undergraduates that have changed their career paths as a result of their work in the garden.

URBAN PARKS AS HABITAT PROVIDERS FOR BIODIVERSITY A MULTI-SCALE ANALYSIS IN THE URBAN AREA OF MILAN

Emilio Padoa Schioppa, University of Milano-Bicocca, department of Earth and Environmental Sciences; Claudia Canedoli, University of Milano-Bicocca, department of Earth and Environmental Sciences; Raoul Manenti, Univeristà degli Studi di Milano, Dipartimento di Bioscienze

Actual trends draw attention to a significant biodiversity decline associated with current and upcoming degree of urbanization. In this context, urban parks can play a crucial role for the conservation of many species within cities. Urban systems are highly dynamic and complex human-shaped ecosystems, leading the maintenance of high biodiversity levels within them a challenging goal to undertake. In this study, we conducted a multi-scale analysis in order to detect how environmental features in an urban area affected biodiversity and we provided suitable information for implement an effective management of green spaces with the aim of support high level of biological diversity. Fifteen urban and peri-urban parks in the metropolitan area of Milan (Italy) were investigated and 93 sampling plots for birds (species and number of individuals) and vegetation (trees Diameter Breast Height) sampled. Results of GLMs at landscape scale showed how bird species richness and abundance are significantly affected by park area and three land cover types and the importance of the environmental variables was determined using RDA components. In a finer level of analysis, we described how 28 bird species respond differently to land cover types, presence of water and distance from park's border within sampling points. Here, wooded land cover type and water bodies resulted to be the variables that mostly affect birds' presence. For forest species, we further investigated the effect of vegetation structure. Results showed unusual pattern for some species (preference of little trees) that can be explained by considering the effects of environmental features acting at different scales. A multi-scale approach is essential to proper understand biodiversity patterns and concerted conservation actions are necessary.

USING A SOCIAL-ECOLOGICAL FRAMEWORK TO INFORM THE IMPLEMENTATION OF CONSERVATION PLANS

Angela Guerrero, University of Queensland; Kerrie Wilson, The University of Queensland

One of the key determinants of success in biodiversity conservation is how well conservation planning decisions account for the social system in which actions are to be implemented. Understanding elements of how the social and ecological systems interact can help identify opportunities for implementation. In this talk I will demonstrate how we applied a social–ecological system framework to identify how social and ecological factors interact to influence the opportunities for conservation. We used data from semi-structured interviews, an online survey, and publicly available data associated to a large-scale conservation initiative in southwestern Australia to develop a conceptual model of the social–ecological system associated with the conservation of that region. We used this model to identify the relevant variables (remnants of vegetation, stakeholder presence, collaboration between stakeholders, and their scale of management) that affect the implementation of conservation actions in the region. We combined measures for these variables to ascertain how areas associated with different levels of ecological importance coincided with areas associated with different levels of stakeholder presence, stakeholder collaboration, and scales of management. We identified areas that could benefit from different implementation strategies, from those suitable for immediate conservation action to areas requiring implementation over the long term to increase on-the-ground capacity and identify mechanisms to incentivize implementation. Finally, I will discuss how the application of a social–ecological framework can help conservation planners and practitioners facilitate the integration of ecological and social data to inform the translation of priorities for action into implementation strategies that account for the complexities of conservation problems in a focused way.

USING A TREE DIVERSITY EXPERIMENT TO EXPLORE SPATIAL CATERPILLAR HOST USE AND DIVERSITY PATTERNS

Karin Burghardt, Smithsonian Environmental Research Center

Understanding how to conserve biodiversity within human-managed landscapes is increasingly important in a world where many natural lands are becoming transformed for

human use. One opportunity for conservation is optimizing tree planting strategies within tree plantations to maximize the biodiversity of other animals supported within the landscape before harvest. However, it is not currently clear how mixed tree species management strategies within tree plantations can be used to support both beta and alpha diversity of associated organisms. Using a paired host experimental design within the BiodiversiTREE experiment located at the Smithsonian Environmental Research Center (SERC), we characterized the community structure and specialization of larval Lepidoptera (butterflies and moths) colonizing trees of 12 focal host species that are either surrounded by conspecifics (monoculture) or a mixture of 4 or 12 native species (polyculture). Lepidoptera is a useful focal taxon for examining this question as they are a diverse group containing many species of conservation concern, they exhibit a wide range of well-documented host specialization, and can easily be tied to a particular host tree. By characterizing patterns in lepidopteran diversity, degree of host tree specialization, and abundance and relating those metrics to host tree diversity, we provide important insight into how forest management decisions impact the biodiversity of insect herbivores within human-managed landscapes.

USING CONTROL THEORY TO DETERMINE THE IMPACT OF INVASIONS ON THE MANAGEABILITY ECOLOGICAL NETWORKS

Fernando Cagua, University of Canterbury; Daniel Stouffer, University of Canterbury; Kate Wooton, University of Helsinki

Modifying the state of degraded ecosystems and preserving that of vulnerable ones are major objectives of current management and conservation science. Such management interventions would benefit tremendously from prior knowledge of the relative difficulty of intervening a particular community. Moreover, while managers usually have a clear idea of what represents a desirable ecosystem state, the complex relationships between members of the community can make it challenging to determine the set of species to which to focus resources. Here, we investigate how the disruptions caused by perturbations like biotic invasions affect our ability to manage ecological communities. Specifically, we capitalise on recent advances in control theory—a method commonly used in engineering to determine and supervise the state of complex systems—and network ecology. We assess the manageability of ten pairs of uninvaded and invaded plant-pollinator networks, and find that invaded networks require a smaller number of management interventions to modify the state of the community. Using this complex system and control framework, we also introduce a novel way to identify the species that have a disproportionate potential to affect the abundances of all other species. Intriguingly, we find that invasive species have a dominant position in every community where they are found. Furthermore, we find their dominant position is underpinned by the asymmetry of their interactions—while the abundance of the invasive species depends only weakly on its interaction partners, their partners depend strongly on the invasive species. Our results provide a theoretical explanation for the known challenges associated with the restoration of invaded communities and highlight how the design of management interventions might benefit from the use of both ecological theory and empiricism.

USING EVIDENCE TO INFORM CONSERVATION EVIDENCE-BASED DECISIONS OR FACT-SUPPORTED BELIEFS

Sana Bau, University of Melbourne

The challenges in facing the global biodiversity crisis demand effective, defensible environmental decision making, which has prompted organisations to make scientific evidence freely accessible in summary format for use in practice. However, subjective judgement, which is susceptible to a number of cognitive biases that interfere with reasoning, remains the most common method of informing conservation management. Insights from cognitive research have direct relevance to conservation practice due to the convergence of technical and value judgements required in dealing with complex and uncertain natural systems intersected with social, economic and political dimensions. I designed a pioneering online method that provides an empirical examination of the influence of a well-established cognitive bias, confirmation bias, on the use of evidence in a realistic bird conservation decision scenario. Confirmation bias is the tendency to preferentially seek information that supports pre-existing beliefs. Participants (n=134) were asked to make a judgement about a choice of four competing management alternatives before and after conducting a review of an evidence base containing 254 summaries of relevant scientific studies extracted from Conservation Evidence (http://conservationevidence.com/), in which they could selectively search for evidence to inform their final judgement. Results of monitoring search patterns reveal a tendency to actively seek out information that supports initial beliefs when reviewing evidence, consistent with confirmation bias. This study is one of the first to identify a pervasive cognitive bias that affects judgement in a conservation decision context. Defensible evidence-based decision making requires fair consideration of supportive as well as non-supportive information. The tendency to fit evidence to pre-existing beliefs may lead to sub-optimal

management outcomes and have important implications for evidence-based conservation practice.

USING IMPACT EVALUATION TECHNIQUES TO GENERATE NOVEL INSIGHTS INTO MPA EFFECTIVENESS

Dominic Andradi-Brown, WWF-US; Gabby Ahmadia, WWF-US; Helen Fox, National Geographic Society; Louise Glew, WWF-US; Jill Harris, WWF-US; Ismu Hidayat, Conservation International; Purwanto, The Nature Conservancy-Indonesia

One of the main threats to the Amazon conservation is the forest conversion to agricultural land. Most of the rainforest soil is extremely poor, low in minerals and nutrients and acidic. This soil needs its vegetation and constant decaying organic material to perform its rapid nutrient cycle. However, the slash and burn agriculture practiced by most farmers does not provide with sufficient organic material to feed the soil, and it will become infertile within a year or two. Regarding at this problem, the third biological station of ACCA, Villa Carmen, was conceived as a research center in tropical conservation and sustainable agriculture. After 6 years of work and research, we analyze of our progress and future steps. The goals of the sustainable agriculture program in Villa Carmen Biological Station are to supply to the station with fresh and high-quality products, to conduct research about the best agricultural practices in the region, and to transmit it. In order to improve soil quality, we built the first biochar kiln in the Peruvian Amazon and start using bamboo biochar to assess its potential in increasing productivity. We are applying different agricultural practices to maintain traditional crops as well as potential new crops for the region. We are also maintaining a national chili pepper germplasm bank and a regional mandioc germplasm bank in our fields. There is still a lot of research to do but we are happy to start watching interest in the local community. Several young students from local institutes will start their practices at Villa Carmen. We see this very optimistic that the experiences at the station will be replicated in the nearby communities.

USING IN SITU DISEASE-MONITORING TO STUDY A REGIONAL FROG EXTINCTION IN THE NEW YORK CITY METRO AREA

Jeremy Feinberg, Smithsonian Institution, SCBI and NMNH; Joanna Burger, Rutgers University

Leopard frogs were once considered to be one of the most abundant and widespread frogs in the New York (USA) metropolitan area. However, these frogs suffered massive regional declines in recent decades and have since vanished from much of the area, including 8 of 11 counties in southeastern New York, and all of Long Island—the largest island in the continental US and a former stronghold for at least one particular species, the Atlantic Coast leopard frog, Rana (Lithobates) kauffeldi. To help explore what role, if any, disease might have played in this regional extinction, we transplanted early-stage leopard frog tadpoles (collected as eggs from extant populations) into formerly occupied wetlands on Long Island where they were raised in enclosures, monitored for growth and survival, and sampled for diseases. Over the course of four repeated trials between 2007 and 2009, we raised tadpoles at six wetlands across the eastern half of the island and found evidence of three deadly anuran diseases: chytridiomycosis (caused by the chytrid fungus, *Batrachochytrium dendrobatidis*), ranavirus, and a recently documented Perkinsus-like organism. Not all diseases were found at all sites, but some sites did have more than one disease, and five out of six sites had die-offs attributable to at least one disease. This research framework can have important conservation implications in revealing potential causes of past extirpations and also helping to explore restoration feasibilities under controlled, low-risk, and low-cost conditions.

USING OLD AND NEW DATA TO RAPIDLY IDENTIFY EXTENT AND DRIVERS OF AQUATIC SPECIES POPULATION DECLINE

Amber Pitt, Trinity College; Tina Delahunty, Bloomsburg University; Sean Hartzell, Bloomsburg University; Jamie Shinskie, Bloomsburg University; Joseph Tavano, Bloomsburg University

Freshwater species are declining rapidly but more data are needed for determining the extent and causes of population declines and extirpations. Integrating newer survey techniques, freely available data, and traditional field work may allow for rapid population assessment. The resulting data can be used to create models for identifying drivers or predictors of population declines. We used detailed historical species records and environmental DNA (eDNA) surveys to identify changes in population distribution of a long-lived, imperiled stream salamander, the eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*), in a 54286 km2 river drainage. We measured within-stream habitat characteristics at each sampling site. We used freely available, high resolution (1 m) remote sensing imagery to evaluate watershed- and reach-scale canopy cover. We evaluated both recent and historic canopy cover to evaluate potential legacy effects associated with historical land use. We used logistic regression with Bayesian inference and AICc model selection to determine which variables were most

important for predicting population persistence and extirpation. Hellbender populations persisted in only 42% of the historical record sites. The best fit model indicated conductivity was the strongest predictor of population extirpation. Increased conductivity, which was strongly correlated with watershed deforestation, may inhibit sperm motility and thus limit recruitment of salamanders and other aquatic vertebrate species with external fertilization. By integrating historical records, eDNA survey techniques, field data, and high resolution remote sensing data, our study design allowed for rapid assessment of predictors of and changes in distribution of an imperiled, aquatic salamander over a relatively broad geographic area. This cost- and time-effective approach may be used for evaluating and prioritizing other elusive and rare aquatic species for conservation.

USING PHYLOGENETIC ENDEMISM FOR CONSERVATION PRIORITY-SETTING: CLADES CLIMATE AND SCALE MATTER

Mary Blair, Center for Biodiversity & Conservation, American Museum of Natural History; Peter Galante, Center for Biodiversity & Conservation, American Museum of Natural History; James Herrera, American Museum of Natural History; Richard Pearson, University College London; Christopher Raxworthy, American Museum of Natural History; Eleanor Sterling, Center for Biodiversity & Conservation, American Museum of Natural History

Phylogenetic endemism (PE) identifies the amount of spatially restricted and evolutionarily isolated biota in a region. Areas with high PE may reflect areas of conservation priority, as loss of biodiversity from these areas would represent disproportionate losses in phylogenetic diversity. Here, we explore patterns of PE among terrestrial mammals in Madagascar and compare our results to recent studies of the global distribution of PE for mammals. Madagascar is an area with exceptionally high levels of endemism and where studies have found evidence of multiple processes of diversification in some groups, including ecological speciation along ecotones. We ask whether analyses of PE at meso-scales might capture patterns that are filtered out at global scales. We calculated PE across Madagascar for all mammals with available data (N=120 species; including bats, 22; lemurs, 51; tenrecs, 22; rodents, 17; and carnivores, 8). Using a generalized linear mixed modeling framework, we examined climatic, topographic, and historical drivers of endemism both with and without controlling for climatic gradients. For all mammals, energy availability and isolation by elevation (IbE) were the most important drivers of PE, similar to global scale analyses. In contrast to the global scale, however, our meso-scale models performed best when controlling for climatic gradients. Climate stability was an important driver of endemism for bats, while post-last glacial maximum climate stability was important for lemurs and tenrecs, and net primary productivity and IbE were important for lemurs and rodents. Our study finds support for the importance of climate gradients on PE at the meso-scale, reflecting an ability to better capture variety in diversification processes. We also demonstrate that both geographic and phylogenetic scale matter in studies of PE, and that exploration of variation across scales is key to informing conservation priority-setting efforts including in Madagascar.

USING STAKEHOLDER-DEVELOPED SCENARIOS TO MODEL FOUR DIVERGENT LAND USE FUTURES IN NW VIRGINIA

Iara Lacher, Smithsonian Conservation Biology Institute; Tom Akre, Smithsonian Conservation Biology Institute; William McShea, Smithsonian Institution; Jonathan Thompson, Harvard Forest

In our rapidly changing world, the need for regional, landscape scale planning to conserve resources and maintain human well-being is becoming increasingly apparent. At larger geographic and temporal scales, there is also a need for interdisciplinary problem-solving, requiring scientists, land-use planners, and policy makers to collaborate among themselves and with outside development interests. This project combines stakeholder feedback on regional socio-economic policies and preferences with expert scientific knowledge and spatial data to produce land use models representing a suite of divergent scenarios for Northwestern Virginia. To do this, we first combined results from two politically distinct sub-regional scenario development workshops to produce one overall vision for the landscape, driven by the intersection of political will and population growth. We then estimate relative differences across the four scenarios defined by these two drivers and modify a previously developed business-as-usual model to create four new land-use models for these new scenarios. These models allow us to identify spatial and temporal relationships within a diverse array of data and apply these relationships to iterative changes in land use in order to project potential future landscapes. Models were developed in Dinamica EGO, an environmental modeling platform, R, and ArcGIS.

USING TEMPORALLY EXPLICIT HABITAT SUITABILITY MODELS TO REDUCE DYNAMIC THREATS TO MOBILE SPECIES

Heather Welch, NOAA NMFS SWFSC ERD; Bob Pressey, James Cook University; April Reside, University of Queensland

Bycatch constitutes a waste of natural resources and significant economic loss to fisheries. Moreover, bycatch can have an impact on species by reducing population sizes, and an ecosystem-level impact through the significant removal of biomass and subsequent trophic changes. In this regard, it is crucial to refine methods for quantifying interactions between fisheries and bycatch species, and to develop management schemes that can accommodate the spatio-temporal variability of interactions. A new method is presented for quantifying interactions between fisheries and bycatch species at high spatial and temporal resolutions. Temporally explicit species distribution models are used to examine the dynamics of fisheries and bycatch. As a case-study, this method is applied to Australia's Eastern Tuna and Billfish Fishery to estimate interactions with seven principal bycatch species. The application of this method towards evaluating the ability of static reserve systems to reduce bycatch is demonstrated, and considerations are outlined for the spatial management of fishery-bycatch species interactions. Australia's Commonwealth Marine Reserve Network had a minimal impact on bycatch reduction under both the 2012 proclaimed and the 2015 panel-recommended zonings. These results highlight the need for threats to marine biodiversity to be incorporated directly into reserve design, instead of assuming threats will be incidentally abated after reserves have been proclaimed, or that off-reserve mechanisms will compensate for inadequacies of reserves. Additionally, interactions can be unpredictable in space and time, and managing these types of interactions through permanent static reserves will be inefficient in terms of opportunity costs to fisheries. Therefore, other spatial management options to accommodate interactions with different types of spatio-temporal dynamics are also explored.

USING THE NEXUS BETWEEN TRADITIONAL KNOWLEDGE AND WESTERN SCIENCE TO ADVANCE CONSERVATION GLOBALLY

Cristina Eisenberg, Earthwatch Institute; Mike Bruised Head, University of Lethbridge; Kansie Fox, Kainai Environmental Protection Agency; Leroy Little Bear, University of Lethbridge

Achieving conservation objectives by conducting ecological research on a landscape scale involves addressing the needs and concerns of multiple stakeholder groups. When working in a region that includes Indigenous communities, it also means working across the deep cultural divide that often exists between Traditional Ecological Knowledge and Western science. We will present the lessons learned and partnerships developed in restoring bison (*Bison bison*), fire, wolves (*Canis lupus*), and fescue (*Festuca spp.*) grassland habitat in southwest Alberta, Canada by the Kainai First Nation, the Kainai Environmental Protection Agency, Waterton Lakes National Park, and Earthwatch Institute, using collaborative, co-created science that balances Traditional Ecological Knowledge and Western Science. This research is part of a transboundary bison reintroduction taking place in the US and Canada. In working toward bison repatriation in this landscape, we have found that partnerships at federal and tribal governmental levels that include non-governmental organizations and universities can deeply engage landowners, tribal elders, citizen-scientist volunteers, students and their teachers, and ecologists. Such collaboration provides a powerful heuristic framework to do ecological research and advance conservation. This model incorporates education, which is a key element in strengthening relationships and finding solutions to conservation challenges. It feeds back knowledge gained on multiple levels, creating financial benefits, improving ecosystem services, and empowering Indigenous communities in land stewardship. We will discuss the development of such partnerships and the applicability of our collaborative, co-created science model to other ecosystems globally, providing real-world examples from our work.

UTILITY OF CITIZEN SCIENTISTS IN A MEGA-DIVERSE COUNTRY MONITORING OUR PLANTS

Dewidine Van Der Colff, South African National Biodiversity Institute; Ismail Ebrahim, South African National Biodiversity Institute; Sjirk Geerts, Cape Peninsula University of Technology; Donna Kotze, Indigo; Eugene Marinus, South African National Biodiversity Institute; Domitilla Raimondo, S African Nat'l Biodiver Inst

In a changing world, monitoring of biodiversity is a challenge as it is very costly and resource intensive. South Africa, one of the world's mega-diverse countries with more than 21000 plant species, citizen science is used to provide the required resources. One fourth of South African plants are threatened with extinction based on IUCN Red List criteria and data collected by the Custodians of Rare and Endangered Wildflowers (CREW) programme, a South African National Biodiversity Institute (SANBI) programme. The programme works with civil society to monitor and collect data on these plants. It combines

data collected by citizen scientists, with expert botanist knowledge to disseminate the results for use by decision makers at local and national conservation agencies, which includes the distributional data used in their conservation plans. Along with this distributional data CREW citizen scientists record threats affecting these plant populations. CREW also coordinates more intense monitoring projects on a select number of species for which long-term demographic monitoring is conducted. These projects involve many stakeholders and allow the opportunity for knowledge exchange between different organizations. One such species is the Critically Endangered *Euryops virgatus* that is only known from a single locality and has been monitored over the last 8 years. With the monitoring being conducted by a non-government organization (Indigo), the CREW programme, the national botanical gardens and a researcher from the Cape Peninsula University of Technology. The data obtained includes population demographic variables and ecological data such as seed-dispersal and –survival, assessing soil seed bank content as well as other experiments. The team of collaborators works together to understand the ecology of this species to make more informed management decisions for species persistence as well as to use the information generated to assist decision making for similar species.

VULNERABILITY ASSESSMENTS OF ANTARCTIC BIODIVERSITY AND APPLICATIONS FOR CONSERVATION PLANNING

Jasmine Lee, University of Queensland

The Antarctic continent is home to substantial numbers of endemic species, including moss, lichens, springtails, tardigrades, mites, nematodes and penguins. While it is largely considered to be pristine, and a "nature reserve, devoted to peace and science", it is actually under threat from multiple pressures, including climate change, invasive species and anthropogenic disturbance (both tourism and science). The Antarctic Peninsula has experienced one of the most rapid temperature rises in the Southern Hemisphere and managing invasive species is the top priority of the Antarctic Treaty System's Committee for Environmental Protection (CEP). Yet, despite this, we know relatively little about how most Antarctic taxa will respond to these threats. Here we assess the vulnerability of different taxonomic groups to multiple pressures, using life history and mechanistic traits, and exposure, sensitivity and adaptive capacity of different species. We demonstrate substantial differences in vulnerability among different biota, varying both within and across taxonomic groupings, biogeographic regions and threatening processes. These results will feed into a prioritization of conservation actions across the Antarctic continent using a Priority Threat Management (PTM) approach, where actions to mitigate threats include designating Antarctic Specially Protected Areas, declaring Specially Protected Species, increasing biosecurity and managing invasive species.

WHAT IS THE APPROPRIATE NULL HYPOTHESIS FOR EXTINCTION?

Kevin Smith, Davidson College

There is a need in conservation biology to understand the underlying processes of extinction with the goal of developing a predictive framework for local, regional, and global extinctions. Although the general threats to modern biodiversity are agreed upon, there is less consensus about why some species may go extinct while others persist in response to a specific disturbance or threat. This suggests that the key question to understanding modern biodiversity loss is not, "What causes extinctions?" but rather, "Why do some species go extinct, while others survive?" This question shifts the focus from ultimate to proximate causes of extinction and emphasizes comparative studies of extinction bias and selectivity, focusing on understanding taxon-specific differences in extinction probability given exposure to the same disturbance. To be effective, such comparisons require an appropriate null hypothesis for extinction probability. I suggest that the implicit null hypothesis for extinction, that "there is no difference in extinction risk among species", is inappropriate and does not take into account patterns that may arise out of random chance alone. The results of a simple simulation model show that even purely random extinction events cause large differences in extinction risk among species, based on differences in species abundance and/or range size. The result that random chance causes differences in extinction risk among species indicates that studies of extinction risk require more sophisticated null hypotheses that first take into account random extinction. Otherwise, random patterns of extinction among species may either obscure the importance of species traits in the extinction process or be misinterpreted as evidence that particular traits are causally associated with extinction proneness. I illustrate this issue using the results of simulation analyses and the analysis of data from natural and experimental extinctions.

WHAT WORKS? A QUARTER CENTURY OF LESSONS LEARNED FROM CONSERVATION EDUCATION PROGRAM EVALUATION

Rebecca Thomas, Slippery Rock University; Tara Teel, Colorado State University

We utilized a systematic review approach to analyze evidence from 79 peer-reviewed studies pertaining to conservation education (CE) outcomes on a global scale. This review aimed to better understand 1) the temporal and spatial trends in CE program evaluations over the last 25 years, 2) patterns evident in the types of conservation and/or social issues addressed through these programs, 3) metrics considered to indicate effectiveness of CE programs, and 4) how outcomes are evaluated and reported. Findings indicated that increasingly, CE programs are being developed in response to both ecological and social issues, yet metrics to indicate effectiveness are rooted in cognition (e.g., knowledge and attitudes). Thus, there is a need to think more holistically about the outcomes of CE programs. Moving forward, greater attention should be given to social and ecological outcomes, as opposed to the traditional focus on cognitive measures as indicators of success, particularly in developing countries. Cognitive outcomes (e.g., knowledge, understanding, awareness, attitudes) were reported more than twice as often as ecological outcomes and social outcomes combined. Secondly, there is a need to consider the ways in which metrics and intended outcomes are determined, evaluated and reported. Who defines the objectives for program evaluation and how they are defined determines what is evaluated and what methods are used. Only eleven publications mentioned that program evaluations were developed collaboratively with audience or stakeholder input in mind. Finally, there is a need for longitudinal evaluation, particularly when attempting to capture ecological outcomes that may not be immediately apparent in order to understand the extent to which outcomes persist into the future. These results can inform the future directions of more comprehensive CE program evaluation in a variety of contexts.

WHEN IT'S TOO HOT TO EAT: CHANGING CLIMATE AND LANDSCAPES AFFECT DIET AND DEMOGRAPHY OF MOOSE

James Forester, University of Minnesota; John Berini, University of Minnesota

The spatial distribution and temporal dynamics of wildlife populations are becoming increasingly difficult to predict as land-use conditions change and uncertainty grows about how animals will respond to novel climate conditions. Many moose populations in the contiguous United States are at the edge of the bioclimatic range of the species and present a unique opportunity to explore how trade-offs between thermal cover, food availability, and predation risk affect habitat use of individuals and spatiotemporal dynamics of populations. Here, we used an eleven-year time series of remotely-sensed land-cover data and spatially-explicit moose survey data in Minnesota to understand how changes in land cover can affect moose population dynamics. To explore the impact of land cover and ambient temperature on individual animals, we used stable isotope analysis of 150 moose to estimate how their diet changed in response to the landscape-level distribution and abundance of land-cover types across a 6° C mean summer temperature gradient. The overall negative trend of the MN moose population could not be explained by spatial variation in land-cover composition alone; however, variation of the amount and arrangement of land cover-types among years and an index of summer severity were significant predictors of local population estimates. Stable isotopic compositions of moose hair showed strong spatial gradients: the moose's diet composition varied by summer temperature region despite similar patterns of forage availability. These results suggest that manipulating the size and arrangement of different land-cover types and forest stand ages can have important population-level effects on moose populations and has implications for the conservation and management of many species at the edge of their bioclimatic range.

WHICH MOUNTAINS PASS? GAPS IN PROTECTION ALONG ELEVATIONAL GRADIENTS WORLDWIDE

Paul Elsen, University of California, Berkeley; Adina Merenlender, Hopland Res & Ext Ctr; William Monahan, United States Forest Service

Protected areas (PAs) are the dominant strategy for conserving biodiversity and sustaining life on Earth. Globally, mountain ranges are considered "cradles of biodiversity", holding disproportionate numbers of endemic, threatened, and overall species. Elevated rates of warming in mountain ranges have resulted in significant shifts in species distributions up and down elevational gradients. Well-distributed PAs in mountain ranges are therefore not only essential to sustaining current patterns of biodiversity, but also to facilitating species movement and adaptation to climate change. We analyzed the elevational distribution of 31,042 PAs in nearly 1,000 mountain ranges around the world using the highest resolution global digital elevation model available, as well as the distribution of total land area in each mountain range. Globally, as expected, we found that the total area protected in mountain ranges declined with elevation, and that this pattern was roughly consistent across each of the six continents we analyzed. However, owing to regional differences in underlying topography, we found that the proportion of protected land by elevation varied substantially across continents. Africa, Asia, and North America were characterized by protecting increasing

proportions of land area with elevation, while Europe and Oceania had peak proportions of protected lands at mid elevations. South America had relatively equal proportions of protected lands across all elevations. Consequently, additional protections required to meet the 17% Aichi Target would need to be allocated in low-mid elevations (<2500 m) of Africa, upper elevations (>2500 m) of Oceania, low (<500 m) and high (>3500 m) elevations of Europe, and all elevations of South America. Despite a prevalent bias towards protecting high elevation lands globally, our results reveal stark regional contrasts in the elevational zones that should be prioritized for future protection.

WHO BEARS THE COST OF FOREST CONSERVATION?

Rina Mandimbiniaina, Ecoles Superieure des Sciences Agronomiques; Mahesh Poudyal, University of Wales,Bangor; Nilsen Spener Andrianantenaina, Ecoles Superieure des Sciences Agronomiques; James Gibbons, University of Wales,Bangor; Neal Hockley, University of Wales,Bangor; Julia Jones, University of Wales, Bangor; Onjamirindra Rakotonarivo, University of Stirling; Bruno Ramamonjisoa, Ecoles Superieure des Sciences Agronomiques; Alexandra Rasoamanana, Ecoles Superieure des Sciences Agronomiques

While the importance of conservation and restoration of natural ecosystems for sustainable development is widely recognised, it is increasingly evident that conservation comes at local costs. Protected areas funded by multi-lateral lenders such as the World Bank have explicit commitments to ensure that local people are not made worse off and that those negatively affected are adequately compensated. Estimating the costs of conservation intervention to local people is difficult but recent evidence shows that carefully designed discrete choice experiments can provide robust estimates alongside more traditional surveys. Using a case study from eastern Madagascar, we explore the magnitude and distribution of local opportunity costs of a new protected area. We estimate a median net present value of the costs per household at US $2500; and that these estimates annualised represent 40-120% of the total annual income for median-income households, with the costs significantly higher proportionally for poorer households. Although some households around the new protected area have received compensation under social safeguards, our study suggests that more than 30% of potentially eligible households were not even identified for compensation, while those receiving compensation were not compensated adequately. Due to their incredible biodiversity and increasing deforestation, Madagascar's rain forests are rightly considered one of the world's highest conservation priorities. Currently some of the poorest people on the planet are bearing the cost of Madagascar's conservation which is unjust and is not sustainable. Conservationists need to face up to the issue of local costs of conservation, however uncomfortable they may be.

WILD DESERTS RESTORATION OF AUSTRALIAS DESERT ECOSYSTEMS INTEGRATING SCIENCE AND MANAGEMENT

Richard Kingsford, Centre for Ecosystem Science, School Biological Earth & Env; David Keith, Centre for Ecosystem Science, University of NSW; Keith Leggett, Centre for Ecosystem Science, UNSW Australia; Mike Letnic, Centre for Ecosystem Science, UNSW Australia; Katherine Moseby, Centre for Ecosystem Science, UNSW Australia; Reece Pedler, Centre for Ecosystem Science, UNSW Australia; John Read, Ecological Horizons; Sharon Ryall, Centre for Ecosystem Science, UNSW Australia; Rebecca West, Centre for Ecosystem Science, UNSW Australia

In the last two hundred years, 29 mammal species have become extinct across Australia, with many more threatened by range contractions and declining abundance. Introduced predators, primarily red fox and feral cat have resulted in governments across Australia investing in establishment of exclosures, where introduced predators and super-abundant herbivores are managed and locally extinct mammals reintroduced. Wild Deserts is a large scale (40,000 ha of paired exclosures) restoration project reintroduce 7 locally extinct mammals into a desert of inland Australia, inside a protected area, Sturt National Park. As researchers, also responsible for management, we take an explicit strategic adaptive management approach, underpinned by the vision to understand, restore and promote desert ecosystems through reintroductions and collaborative partnerships. We describe how linking science to management, through an adaptive governance framework, driven by our vision and linked to hierarchy of specific objectives which tie into a sequential process of restoration of a large desert ecosystem area by reintroducing locally extinct species. We present a conceptual framework of current cause and effect relationships and our prediction of how these will change with restoration. The hierarchy of objectives increases in resolution, explicitly linked to our management actions. Management actions will be monitored to determine effectiveness, not just on reintroduced species, but the entire ecosystem, including soils, plants, invertebrates, reptiles, other mammals and birds. Over the coming decade, our aim is to also 'fast-track' predator avoidance behaviour of reintroduced species, as well as reduce

densities of introduced predators and superabundant herbivores in areas outside the exclosures. This will allow the 'reinvasion' of desert ecosystems, aiming to establish free-living viable populations of the locally extinct mammals.

WILD-CAPTURE DEMOGRAPHY AND LONG-TERM POPULATION VIABILITY IN SEMI-CAPTIVE ASIAN ELEPHANTS

John Jackson, University of Sheffield

As a result of anthropogenic activity, many vulnerable species are managed in captivity, but these ex situ populations are often at a greater risk of extinction and may actually hinder long-term conservation goals. Furthermore, individuals may have to be captured from the wild in order to supplement captive populations, further reducing population viability in the wild. Asian elephants are unusual amongst endangered species as they have a large captive population (~16,000), increasing the importance of ex situ management. Many of these captive elephants are used in working populations, most commonly in the timber trade, which have been supplemented through wild-capture. Here we explore the implications of wild-capture for population viability in a large, semi-captive working timber elephant population in the Union of Myanmar, using age and stage (birth origin) structured population projection models with immigration terms. Population projections reveal that the working population is not sustainable without the capture of individuals from the wild. However, individuals captured from the wild contribute less to population growth than their captive-born counterparts, suggesting that targeting fertility and survival in captive-born is vital for future management strategies. Juvenile mortality in captive-born elephants in particular is limiting population growth, and must be addressed to improve future viability. Improving the efficiency and effectiveness of captive management strategies will ultimately prevent biodiversity declines.

WILDLIFE OCCUPANCY AND INTENSITY OF USE IN RESPONSE TO HUMAN ACCESS TO PUBLIC OPEN SPACE

Susan Townsend, Wildlife Ecology & Consulting

Open space is important to conserve wildlife. Open space, especially in places like California, is enjoyed by recreationalists using trails for hiking, biking and walking their dog. Wildlife preferentially use trails for movement and may reduce trail use when humans are present. How human presence on trails affects wildlife abundance in the surrounding landscape was the subject of this study. The Wildlife Picture Index (WPI), monitoring at the landscape scale using camera traps, has been implemented at a number of sites in the San Francisco Bay Area in the state of California in the United States. At a specific site, trail cameras, in addition to WPI cameras, were used to obtain intensity of wildlife and human use. Baseline trail use and wildlife abundance was established for a year prior to public access and then compared to seasonal use for a year afterwards. Several other concurrent WPI monitoring sites were used as controls to understand aggregated and disaggregated species-specific abundance and community composition relative to the subject site. Our results indicate that carnivores had a mixed response to human presence; mesocarnivores appeared largely undisturbed, while the largest carnivore, *Puma concolor*, did initially decrease trail use and abundance. Diurnal species, such as the deer, *Odocoileus hemionus*, and the gray squirrel, *Sciurus griseus*, altered trail use specifically with no change in abundance in the surrounding landscape. Interestingly, one year after the park opened to the public, most species recovered to pre-opening detection rates and occupancy. These findings indicate that length of studies (more than a year) may be important in determine if and when wildlife habituate to human use.

YELLOWEYE AND QUILLBACK ROCKFISH ABUNDANCE AND BENTHIC HABITAT PARAMETERS IN BRITISH COLUMBIA

Mauricio Carrasquilla, University of Victoria, Dana Haggarthy and Lynne Yamanaka, Fisheries and Oceans Canada; Francis Juanes, University of Victoria

Yelloweye and Quillback rockfish are particularly vulnerable to overfishing due to their long life span, their late maturity, small home range and high site fidelity. Thus, understanding critical habitats for these species is crucial. Studies relating habitat characteristics with presence and distribution of rockfish at large scales remain scarce. The purpose of this study was to analyze potential relationships between benthic habitat characteristics, fish size and abundance of two rockfish species (Yelloweye and Quillback) caught in longline surveys in the Strait of Georgia. Slope, rugosity, were calculated from a 20m resolution bathymetry layer as habitat parameters. The proportion of rock, mixed substrate, sand and mud were also calculated under each line. Presence and absence of the two species were determined at each individual site and habitat parameters between presence and absence compared. Abundance and size were modeled with respect to depth, slope and rugosity. Slope ($x = 15.46 \pm 11.77$, $p < 0.05$) and rugosity ($x = 0.0037 \pm 0.0045$, $p < 0.001$) were higher where rockfish were present. Size decreased as slope increased ($R2=0.35$, $p < 0.05$) but was non-significant for rugosity ($p = 0.085$) and depth ($p = 0.8$). The differences in slope and rugosity demonstrate the importance of complex habitat for the conservation of these two species. While ROV data offer valuable visual habitat and fish information, longline surveys may be a more cost-effective and appropriate method for large-scale studies.

21ST CENTURY SCIENCE LEADERSHIP IN CONSERVATION BIOLOGY

Michael Schwartz, USFS National Genomics Center for Wildlife and Fish Conservation

Strong science leadership will be needed to meet the conservation challenges of the 21st century. Previous discussions amongst the conservation biology community have recognized that conservation biology requires two types of leaders, those who focus on effective conservation science via developing state of the art science, and those leaders who integrate science into policy, management, and society-at large. While there has been attention paid to the latter, there has been little discussion on how to develop leaders who can identify where conceptual developments are needed for producing actionable science. This is unfortunate as science is a cornerstone of conservation biology, as the initial goals of the discipline were to "provide principles and tools for preserving biological diversity" (Soule 1985). This symposium brings together leaders of upper levels of government agencies, non-government organizations, and academia to discuss principles and case studies in scientific leadership. It starts with defining scientific leadership and identifying the problems of using traditional business leadership goals, strategies, and targets in the arena of science. Subsequent speakers will then define the essential elements of science leadership, recognizing that science leaders are often not in "command-and-control" situations where they are assigned top-down control of an organization. Scientific leadership can come from the middle of organizations or can be grassroots. Developing effective science leaders is essential but underappreciated. We believe that this symposium will be of great interest to the Conservation Biology community as strong science leadership can act as a force multiplier, amplifying scarce resources to be most effective in the accumulation of knowledge that can be applied to preserve biodiversity.

ADAPTING TO CLIMATE CHANGE EFFECTS AT EXTREME LATITUDES AND ELEVATIONS

Molly Cross, Wildlife Conservation Society

Climate change is likely to affect conservation targets across the globe, but species at extreme latitudes and elevations face particular challenges. The rate and magnitude of warming is projected to be more extreme at high latitudes, and places closer to the poles and higher in elevation often tend to be covered in ice and snow, conditions that are vulnerable to warming. Confronted with rapid and large changes in climate, plants and animals in high latitudes and on mountaintops may not have options for finding nearby areas that are relatively cooler or more climatically suitable. These challenges also affect the livelihoods of indigenous communities in these extreme landscapes– livelihoods that can be inextricably linked to the health of wildlife and ecosystems. The dramatic changes expected from climate change in these landscapes pose serious questions about whether and how we will be able to conserve plants, animals and livelihoods– What do we need to do more of? What do we need to do differently? How do we think about our goals for nature conservation and human well-being in the face of these transformative changes? We will hear from ecologists, policy analysts and funders about the challenges that climate change poses for nature conservation and indigenous livelihoods spanning the Arctic to the Patagonian Steppe, and strategies for adjusting our conservation actions, policies and investments to cope with this accelerating threat. Then we will discuss opportunities for maintaining conservation, socioeconomic and cultural values in these highly vulnerable landscapes.

ADAPTIVE MANAGEMENT IN LATIN AMERICAN PROTECTED AREAS CHALLENGES AND OPPORTUNITIES

Eduardo Silva-Rodriguez, Departamento de Ecología y Biodiversidad, Universidad Andres Bello, Chile; Maximiliano Sepulveda, Gerencia de Areas Silvestres Protegidas, Corporacion Nacional Forestal, Chile

Uncertainty and lack of "sufficient" information are more the norm than the exception in conservation practice. However, many pressing problems that affect biodiversity require decisions that cannot wait for sufficient or even minimal information. Adaptive management often is recommended because, through monitoring and evaluation, proximate decisions can be adapted. However, the flexibility of adaptive management often collides with rigid structures that include regulatory instruments, personnel performance metrics, and general resistance to change. In addition, many practical constraints challenge the flexibility required for adaptive management. For example, sharing is critical for learning; however sharing "failures" may be problematic, especially for those who "failed". Similarly, implementation of monitoring plans is constrained by severe resource limitation and poor understanding of the natural history of conservation targets. Despite these and other limitations, adaptive management is being implemented in protected area systems in Latin America. Here we will present results of adaptive management experiences from governmental, nongovernmental and academic perspectives. Each of the case studies includes unique features, but also important commonalities that transcend local scales.

ADVANCES IN ASSESSING EFFECTIVENESS OF CONSERVATION POLICIES LATIN AMERICA

German Forero-Medina, Wildlife Conservation Society; Daniela Miteva, Duke University

Latin America hosts a large number of species and is of primary importance for carbon sequestration and maintaining global precipitation patterns. At the same time, it continues to experience rapid deforestation and ecosystem degradation due to agricultural and mining expansions. As pressures on biodiversity continue in Latin America, an array of potential solutions are adopted and implemented by governments and the civil society. To counteract threats that cause deforestation, habitat degradation and species loss, a host of policies including devolution of rights to local communities, protected areas, forest concessions, forest management and supply chain certification have been adopted. Many of these do not include rigorous monitoring to assess their effectiveness for biodiversity conservation. For this reason, only limited evidence exists of the impacts on the ground. This session will bring together researchers employing a variety of methods ranging from rigorous impact evaluations employing big geospatial data to studies reliant on in-depth field data obtained from surveys on the ground to studies exploiting citizen science. The objectives of this symposium are (1) to present recent advances on an array of tools that can be used to assess effectiveness of conservation interventions and support on the ground conservation, and (2) to provide a forum to discuss potential ways to integrate big-data analyses with ground data, in order to improve conservation outcomes on the ground.

ANIMALS FROM THE WILD HOW MUCH WILL THEY COUNT IN SUSTAINABLE FOOD SYSTEMS OF THE FUTURE

Nathalie Van Vliet, CIFOR; Robert Nasi, CIFOR

Whether they are obtained through hunting, fishing or harvest, wild animals continue to contribute to the diets of human populations. Our session, beyond illustrating the diversity of wild animals used in different ecosystems of the world, will foremost discuss the challenges and opportunities for wild animal foods to continue to feed humans in the future. The focus will be on understanding and discussing the tradeoffs related to the use of wild animal foods, including the ecological sustainability of the harvest, the health and food safety challenges associated with the consumption of wild foods and the competition from highly processed and industrialized meats characteristic of the nutritional transitions. In a context in which governments are under increasing pressure to balance biodiversity conservation, food security and human health, we will discuss the feasibility and effects of conserving wild animal foods in the menus of future sustainable food systems.

A STANDARD FRAMEWORK TO CONVERT SPATIAL DATA INTO MEANINGFUL CONSERVATION MANAGEMENT INFORMATION

Lilian Pintea, the Jane Goodall Institute; Nick Salafsky, Foundations of Success

In recent years, expansion in the scale and the scope of our conservation work has required that we integrate conceptual and spatial conservation planning. There is also a growing torrent of geospatial data on ecosystems and species from remote sensing tools and crowdsourcing platforms. Satellite images showing changes in forest cover. Ranger patrols mapping poaching snares. Community projects conducting stakeholder analyses. Donors assessing results of conservation interventions.

And there is a proliferation of systems for managing these data. We need a standard framework for converting these data into useful information for project management and decision making. For example, common classifications to systematically describe conservation work. Common indicators for assessing viability of a species. Common metrics for determining the threat status of a forest. Or common standards for mapping the location and determining the effectiveness of conservation actions. This standard framework, when coupled with appropriate intellectual property sharing arrangements, is the key to more coordinated and effective largescale adaptive management of species and ecosystems. It is also the basis for shared learning that is the foundation of true evidence-based conservation. An inter-disciplinary working group of conservation practitioners, researchers, funders and policy makers has pilot-tested integrating spatial data with the Open Standards for the Practice of Conservation in the context of large-scale conservation projects around the world. In this symposium, we present the results of this work, drawing on case studies involving Chimpanzees Conservation in Tanzania, Siberian Cranes Across Continental Flyways in East Asia, Conservation Work with Indigenous Peoples in Colombia and Suriname, and Managing an Ecoregion in the Western United States. We then present key principles that have emerged from this work and a plan for developing and rolling-out this framework at scale.

BIODIVERSITY INDICATORS: MEASURING CHANGE IN A DYNAMIC AND UNCERTAIN WORLD

Michael Burgass, Imperial College London; Emily Nicholson, Deakin University

The aim of this symposium is to review lessons learnt & short comings from the current global indicator process, highlight methodological advances and requirements in indicator design, and discuss future frameworks for indicator use. Despite the proliferation of biodiversity indicators, there remain large challenges to their effective implementation. Many biodiversity targets have poorly aligned indicators or no indicators at all and the majority of these remain untested. Indicators can and should contribute to policy formulation and evaluation at global, regional, local levels if properly constructed, but is rarely the case and gaps remain in the understanding of how indicators work and relate to real life in an uncertain and dynamic world. This symposium will demonstrate lessons learnt from well-known environmental indicators, new research in testing and improving current indicator design as well as new frameworks to work towards. The symposium will stimulate discussion on these aspects, the role of indicators in policy and how society chooses to move forward. The first 60 minutes will be 5 presentations of 12 minutes, followed by a chaired 30-minute panel discussion. Panelists will take audience questions to discuss the content of the presentations and future directions of indicators.

BIODIVERSITY KNOWLEDGE MANAGEMENT FOR FLORA CONSERVATION IN MEGADIVERSE COUNTRIES

Carolina Castellanos, Instituto Alexander von Humboldt

Every day new biological data is being produced by researchers, government institutions and an increasing number of citizens. In addition, a great realm of historical data lays in biological collections and unpublished documents. How to effectively use scientific data for biodiversity management and policymaking is a challenge been faced by many countries, especially those considered as megadiverse, due to the high percentage of species diversity they hold and the responsibility this involves? Brazil, México, Colombia and South Africa together possess more than 100.000 species of plants and there is a great need to monitor their conservation status. In this scenario, red listings offer an effective approach to prioritize conservation actions and position threatened species in the focus of politicians and society. At present, national red listings are available in these countries and an established institutional framework for flora conservation is in place. However, there are still gaps to improve in terms of capacity building for management and use of biodiversity information, science-policy interface and society involvement. To address these gaps, a collaborative network of biodiversity institutions is taking place, with the aim of finding solutions to common problems through knowledge and technology transfer.

CHALLENGES AND OPPORTUNITIES IN USING A BIOCULTURAL DIVERSITY CONSERVATION FRAMEWORK

Fabrizio Frascaroli, University of Zurich; Rick Stepp, University of Florida

This symposium explores challenges and future directions in linking the conservation of biological and cultural diversity. The notion of biocultural diversity has been gaining traction for over a decade. Among else, it provides a robust and empirically tested framework for integrating environmental and human dimensions in conservation. Yet, biocultural approaches still face a number of difficulties. Firstly, there are no definitive methods or guidelines for translating a biocultural framework into actual conservation initiatives. Further, the success of biocultural

conservation often depends on involving groups that have been long underrepresented in conservation, like indigenous people and faith communities. This requires specific strategies of engagement and a level of disciplinary integration that is still uncommon for most scientific and implementation projects. Securing institutional support and funding for interdisciplinary projects also remains problematic, in spite of growing attempts to redress this issue. Finally, legal and policy mechanisms need to be further developed to promote biocultural conservation schemes at different scales. The symposium reviews these and other challenges through selected presentations. Enough time is also allocated to discussing responses and strategies that can advance biocultural approaches in research and implementation. The future of conservation largely hinges on creating broader coalitions and delivering long-lasting solutions. Biocultural approaches offer critical opportunities in this sense, whose timeliness and potential must be seized.

CO-BENEFITS AS INCENTIVES FOR CONSERVATION IN HUMAN-DOMINATED LANDSCAPES

Peter Arcese, University of British Columbia; Nina Morrell, University of British Columbia; Amanda Rodewald, Cornell University

Global protected areas have expanded rapidly in pursuit of the Convention on Biodiversity Aichi Target 11 to conserve a representative 17% of terrestrial and inland waters ecosystems, and Target 12 to prevent the loss of threatened species. But business as usual reserve selection and historic biases for unproductive landscapes still limit efficient investment in conservation. In Canada, for example, a country where roughly 89% of land mass is 'crown land', meeting CBD targets has been particularly challenging despite doubling the extent of protected areas since 1995. Unfortunately, new protected areas on public lands have done little to protect Canada's 600 at-risk species, because ¬≥60% of them occupy human dominated landscapes where protected areas remain rare and small on average. This problem is common to virtually all nations given the confluence of human development, ecosystem productivity and native species richness. Thus, a key challenge to conserving global biodiversity is to develop tools to incentivize conservation where competing interests and values are at play. This symposium highlights novel approaches to strategic planning in human-dominated landscapes to emphasise multiple values and the development of markets for conservation co-benefits to overcome social and economic barriers to conservation.

CONSERVATION AND STORYTELLING IN A POST-TRUTH WORLD

Alex McInturff, University of California, Berkeley; Justin Brashares, Univ of Ca, Berkeley; Lauren Withey, UC Berkeley

The surprising political events of 2016 have demonstrated the power of narrative so emphatically that many claim we now live in a post-truth world. In this context, conservation biology must embrace new opportunities and obligations. A growing contingent of scientists has recognized opportunities to engage new audiences and access policymaking through storytelling. Meanwhile, interdisciplinary work has revealed powers of stories that oblige us to broaden our thinking: stories shape and express worldviews that have ecological and political consequences, influence the way stakeholders judge conservation, and define the field's priorities and methods. In this symposium, we explore storytelling as a framework in which practitioners, scientists, and stakeholders can better communicate with diverse audiences, approaches, value systems, and responsibilities. We will learn from those using narrative to broadcast scientific findings in politicized landscapes, journalists using new media to engage with stakeholders and public figures, and conservation practitioners telling stories that facilitate public engagement. Representatives of groups often unheard in the conservation world will demonstrate how translating both scientific and culturally-embedded notions of conservation through stories generates better outcomes for all. This symposium will help conservationists build tools to effectively and ethically navigate a new post-truth world.

CONSERVATION CHALLENGES AND OPPORTUNITIES IN AREAS OF ARMED CONFLICT

Pablo Negret, University of Queensland; Jose Manuel Ochoa Quintero, Universidad Federal de Mato Grosso do Sul; Andres Suarez Castro, University of Queensland

In the last 50 years, 80% of the world's armed conflicts have taken place in biodiversity hotspots. The presence of armed groups is commonly associated with an increase of threats to biodiversity. Consequently, decisions of how those challenges are faced in conflict areas have important consequences on the natural resource management. There is a need to account for conflict scenarios and risks in order to make informed decisions that help to meet conservation targets. This symposium will provide the opportunity to discuss how to explicitly account for conflict risks in conservation decision-making, while promoting the design of conservation strategies with positive socio-

economic impacts. Additionally, it will generate a common understanding about different strategies aiming to face biodiversity conservation challenges given different conflict scenarios. International experts will share experiences on: 1. Spatial overlap patterns between conflict risk and high biodiversity areas; 2. Assessment of competing objectives in post conflict scenarios (e.g., economic development vs. conservation); 3. Effective conservation planning in conflict and post-conflict scenarios.

CONSERVATION IN AN URBANIZING WORLD: CONSERVATION SCIENCE AND APPLICATION IN URBAN SYSTEMS

Travis Gallo, Urban Wildlife Institute, Lincoln Park Zoo

Urbanization has significant effects on global biodiversity through increased demands for natural resources, landscape modifications, and habitat alterations. However, the science and practice of urban conservation is not limited to conserving species and habitats, but also encompasses socio-economic issues, human values, and environmental aesthetics. As urbanization and its consequences for biodiversity magnify, understanding the nexus between ecology, social science, and urban planning is more important than ever. This symposium will highlight some of the world's most state-of-the-art ecological, social, and policy-relevant research in the field of urban ecology. Presentations will cover applied topics such as the functionality of urban green spaces, multicity approaches to urban wildlife conservation, and exploring the relationship between urban green space and human well-being. This symposium is intended to complement the symposium "Conservation in an Urbanizing World: How is urbanization changing the science and practice of conservation?" Together these symposiums will facilitate an informative conversation about urban conservation such that the audience can feel better equipped to continue the conversation in their professional and personal lives. Therefore, this symposium will conclude with an interactive panel-audience discussion about the next frontiers in conserving biological diversity in an urbanizing world.

CONSERVATION IN AN URBANIZING WORLD: HOW IS THE SCIENCE AND PRACTICE OF CONSERVATION CHANGING

Marit Wilkerson, USAID

Urbanization has significant effects on global biodiversity through increased demands for natural resources, landscape modifications, and habitat alterations. However, the science and practice of urban conservation is not limited to conserving species and habitats, but also encompasses socio-economic issues, human values, and environmental aesthetics. As urbanization and its consequences for biodiversity magnify, understanding the nexus between ecology, social science, and urban planning is more important than ever. This symposium will highlight some of the world's most state-of-the-art ecological, social, and policy-relevant research in the field of urban ecology. Presentations will cover applied topics such as the functionality of urban green spaces, multi-city approaches to urban wildlife conservation, and exploring the relationship between urban green space and human well-being. This symposium is intended to complement the symposium "Conservation in an Urbanizing World: How is urbanization changing the science and practice of conservation?" Together these symposiums will facilitate an informative conversation about urban conservation such that the audience can feel better equipped to continue the conversation in their professional and personal lives. Therefore, this symposium will conclude with an interactive panel-audience discussion about the next frontiers in conserving biological diversity in an urbanizing world.

CONSERVATION PLANNING WHERE IS IT NOW WHAT IS ITS POTENTIAL AND HOW DO WE GET THERE

Sam Lloyd, Imperial College University

If conservation science is to contribute to sustaining the diversity of life on earth, then it must inform and influence human behaviour. Conservation planning has emerged to address this need, acting as a vehicle for translating complex ecological understanding into an easily communicated set of priorities, activities, and goals. Considerable attention has been devoted to developing plans designed to both guide conservation interventions and communicate conservation knowledge to other sectors. Reports from practice suggest however that effective implementation depends not just on the final product itself, but on the approach used in plan creation and dissemination. This symposium will bring together speakers from government, private sector, NGOs and academia to share their experiences of using conservation plans in practice. The presenters will discuss how they have used the approach to influence political decision making, mitigate the impact of development, and bring multiple organisations together under a single goal. The academic literature has widely addressed the technical issue of processing and presenting information, this symposium however aims to further the debate on how to overcome the ubiquitous issue of transitioning from knowledge to effective action and political influence.

CONSERVING COTTON-TOP TAMARINS IN COLOMBIA: AN INTEGRATED AND STRATEGIC APPROACH IN SAVING A SPECIES

Katie Feilen, Disney's Animal Kingdom; Anne Savage, Disney's Animal Kingdom

Since 1987, Proyecto Tití (PT) has used a multidimensional approach with scientific research, community programs, education, and forest conservation to reduce deforestation and the illegal pet trade. Addressing the needs of communities, PT develops innovative solutions that increase the level of local partnerships and position the cotton-top tamarin (ctt) as a flagship species for conservation in Colombia, which has led to a successful program that is reversing the decline of this species in the wild. Our long-term scientific studies have provided the first information on social organization, infant development, feeding ecology, reproductive biology, and how habitat changes have influenced this species in the wild. Through our Tití Ventures program, we have developed programs that reduce the need to extract forest resources, are positively impacting the environment, and developing economic alternatives for communities. Our education programs work to engage students from elementary thru secondary school in activities that promote the conservation of ctt and program evaluations have shown that knowledge and attitudes have positively changed as we develop the next generation of environmental stewards. However, given the dramatic reduction in forest coverage in Colombia, efforts to conserve some of the last remaining forest strongholds for ctt are critical. We have worked in partnership to form three protected areas and developed restoration and reforestation efforts. These combined efforts have effectively helped us to determine that the current population of ctt has remained stable for the last five years, a remarkable accomplishment given the increasing pressures of human population growth and agricultural expansion in Colombia.

CORAL REEFS CONSERVATION EFFECTIVENESS

Nohora Galvis, Observatorio Pro Arrecifes Coral, Fundacion ICRI Colombia

It is relevant the identification, measurement and monitoring of indicators of Conservation Effectiveness in coral reef areas to plan improvement of management efforts. Managers think global and act locally to report accountability. However, they face national priorities for unsustainable development that may hamper the survival of coral reef areas. Low Effectiveness Percentages seem to be normal in current coral reef ecosystems. While some that are far away from populated areas present low coral cover others that are close to overpopulated areas that are not yet protected, have resilient high healthy coral cover. Multidisciplinary Scientific explanations including from citizen science to genetics, point at different levels of adaptation to chronic or acute exposure to anthropogenic impacts such multinational oil exploration, dredging, shipping, illegal fishing, weapon testing, garbage and sewage dumping that may exacerbate global warming effects in isolated coral reefs. International Case studies find approaches for adaptive management focus on research questions such as: 1) Recommendations to improve effectiveness of conservation to achieve ecological, social and economic objectives; 2) Successful efforts for Multi-Species Coral Reef Ecosystem Restoration vs. Constrains faced by the Coral Mono-Species Restoration; 3) Integrative approaches.

COST-EFFECTIVE TOOLS TO SUPPORT CONSERVATION DECISION-MAKING FOR PROTECTED AREAS IN LATIN AMERICA

Isaac Goldstein, Wildlife Conservation Society; Viviana Ruiz-Gutierrez, Cornell Lab of Ornithology, Cornell University

Protected areas cover around 14% of the planet's land surface, and are still considered as one of the most effective strategies for conserving the world's biodiversity and natural capital. Latin America has the most land within protected areas in the world- there are 1,949 officially declared protected areas playing a key role in the climatic stability of the region. Recent work by Leisher et al. (2013) found that an estimated 45% of protected areas in Latin America suffered significant land and forest degradation from 2004-2009, and increasing trends in pressures and threats to these critical lands are not showing much signs of declining. To best address the complexity of issues threatening protected areas, we need cost-effective, scalable tools that can provide robust information that is directly linked to the decision-making infrastructure of the protected areas themselves. Most often, protected area staff and officials in charge of designing and implementing management plans for protected areas do not have access to cost-effective, robust approaches to collect and generate much needed information. The end result is a mismatch between the information that can be reliably be collected with the information that is needed to best guide conservation and management practices on the ground. The session will bring together a wide range of experiences in cost-effective monitoring to inform best management practices for protected areas in Latin America. The specific objectives of this symposium are to (1) present examples of applications of cost-effective monitoring tools to generate information that is directly

linked to information needs of management plans, and (2) discuss how to best scale and improve lessons.

CRITICALLY EXAMINING 'SUCCESS' - SESSION I: EXPLORING THE POLITICS OF HOW 'SUCCESS' IS CONSTRUCTED

Josie Chambers, University of Cambridge; Robert Fletcher, Wageningen University; Chris Sandbrook, UNEP World Conservation Monitoring Centre

Among conservation projects, the narrative of 'win-win' success for people, biodiversity, and climate change is commonplace. Yet, efforts to probe these notions of 'success' often expose unintended impacts and local contestations, such as the leakage of deforestation into other areas and exacerbated social inequalities. These contradictory accounts emerge from divergent practices for prioritizing and interpreting outcomes in ways which best serve particular aims. This three-part symposium seeks to critically examine how and why conservation project 'success' narratives can become unrepresentative of local realities, and how interdisciplinary approaches can help improve accountability. Session I focuses on the underlying political dynamics, common practices and assumptions which can facilitate a significant mismatch between interveners' perspectives of project 'success' and local realities. The speakers explore the potential to reframe outcome-focused narratives of 'success' as broader on-going adaptive socio-political processes to improve their local accountability

CRITICALLY EXAMINING 'SUCCESS' - SESSION II: HOW ACCOUNTABLE SUCCESS STORIES ARE TO LOCAL REALITIES

Gert Van Hecken, University of Antwerp; Josie Chambers, University of Cambridge

Among conservation projects, the narrative of 'winwin' success for people, biodiversity, and climate change is commonplace. Yet, efforts to probe these notions of 'success' often expose unintended impacts and local contestations, such as the leakage of deforestation into other areas and exacerbated social inequalities. These contradictory accounts emerge from divergent practices for prioritizing and interpreting outcomes in ways which best serve particular aims. This three-part symposium seeks to critically examine how and why conservation project 'success' narratives can become unrepresentative of local realities, and how interdisciplinary approaches can help improve accountability. Session II explores how well intervention narratives of 'success' and local realities align in practice, drawing on empirical evidence from Payment for Ecosystem Service projects and community-based conservation initiatives across Latin America and Sub-Saharan Africa. The speakers seek to develop understandings of 'success' which move beyond superficial 'panacea' views and are rooted in the particularities of heterogeneous socio-ecological contexts.

CRITICALLY EXAMINING 'SUCCESS' - SESSION III: INTERDISCIPLINARY APPROACHES TO MEASURING SUCCESS

Jeremy Brooks, The Ohio State University; Daniel Miller, University of Illinois; Josie Chambers, University of Cambridge

Among conservation projects, the narrative of 'winwin' success for people, biodiversity, and climate change is commonplace. Yet, efforts to probe these notions of 'success' often expose unintended impacts and local contestations, such as leaked impacts into other areas and exacerbated inequalities. These contradictory accounts emerge from divergent practices for prioritizing and interpreting outcomes in ways that best serve one's interests. This three-part symposium seeks to critically examine how and why conservation project 'success' narratives can become unrepresentative of local realities, and how interdisciplinary approaches can help improve accountability. Session III explores how conservation success has been operationalized by scholars and practitioners, conservation organizations, government agencies, and donors. Particular attention is paid to tradeoffs and synergies among outcomes and efforts to develop practical indicators. Talks in this session will review various success measures and discuss proxy indicators. This session concludes with a discussion about the challenges with operationalizing notions of 'success' which are accountable to local realities in conservation research and practice.

DEVELOPING THE SCIENTIFIC BASIS THAT ENABLES BUSINESSES TO SUPPORT BIODIVERSITY CONSERVATION

Joseph Bull, University of Copenhagen – KU; Prue Addison, University of Oxford

The fundamental goal of conservation science is to provide the technical understanding and tools that enable humanity to conserve biodiversity. Endusers of conservation science include international policymakers, governments, and NGOs. More recently, an important end-user of conservation science has emerged – businesses, an increasing number of which seek to take an active role in biodiversity conservation. Businesses face serious barriers that prevent them from supporting biodiversity conservation. These barriers are scientific, as much as

social and economic, including: establishing metrics for objectively evaluating and reporting on biodiversity performance; methods for comparing performance across multiple scales; and, managing biodiversity in the face of uncertainty. In fact, efforts to conserve biodiversity as part of business operations expose gaps in the scientific basis underlying conservation science more generally. In this symposium, we will discuss 'business and biodiversity' though the lens of topics including 'no net loss' conservation mechanisms (e.g., biodiversity offsetting), natural capital accounting, and factoring industry into landscape conservation planning. The symposium will showcase recent developments in the 'business and biodiversity' research field, identify critical research gaps, and will provide an opportunity for delegates to join discussions around engaging businesses more meaningfully in applied conservation.

ENGAGING MEMBERS OF FAITH COMMUNITIES IN CONSERVATION RESEARCH AND PRACTICE

Jame Schaefer, Marquette University, THEOLOGY

Based on the Best Practices Survey conducted from May 31 to September 10 by the Religion and Conservation Biology Working Group of the Society for Conservation Biology, this symposium features six presentations by Survey respondents who share their constructive engagements with leaders and members of faith communities to achieve the goals of conservation projects. Each presenter describes the project with focus on the following: (1) Its nature that required and/or benefitted from relating to faith communities; (2) knowledge of the faith of the community before beginning the project, when it was completed, and sources used to learn about them; (3) how members of the faith communities were engaged in the project; (4) the outcome of the project goals and unexpected benefits; and, (5) key factors that led to successful engagement with members of the faith communities. Shared during this symposium are projects in regional sections of the SCB: Africa--gaining information about sacred forests from reluctant indigenous Nigerians; Asia--recovering populations of mammals in collaboration with Buddhists and indigenous communities in Thailand; Latin America/Caribbean--exploring the receptivity of the creation care principle among Christian Pentecostals in the Andes of Peru; North America--working with members of the Ho Chunk Nation in northwestern Illinois to develop a management plan for scattered effigy and burial mounds; and, Oceana--striving to manage a community-based Tree Kangaroo conservation program with indigenous people in Papua New Guinea. An overview of the Best Practices Project precedes the presentations. Culminating the symposium is a description of and an invitation to participate in the subsequent workshop during which best practice guidelines will be drafted.

GLOBAL CONNECTIVITY CONSERVATION DESIGNATION AND DESIGN

Gary Tabor, Center for Large Landscape Conservation

With Earth's human population on a trajectory to grow by 3 billion people in the next 50 years, the cumulative impact of human activity on the planet requires a new approach to conservation. Ecological connectivity conservation links natural and seminatural landscapes, mitigating habitat fragmentation and enabling migratory flows essential to a fully functioning, resilient system. Yet, there is still little practical application to ensure ecological connectivity is protected. Now, two solution sets are emerging as opportunities to implement connectivity conservation on a global scale. First, The International Union for Conservation of Nature (IUCN) has launched a new Connectivity Conservation Specialist Group (CCSG) within its World Commission on Protected Areas. The membership-driven CCSG is charged with developing a new conservation designation for the world's governments to adopt–Areas of Connectivity Conservation (ACC). Second, ecological connectivity may be preserved through mitigation and strategic design of linear infrastructure, including roads, rails and pipelines. As part of the ACC process, a Transport Working Group has been formed to provide direction towards mitigating infrastructures' impacts on wildlife movement and mortality. This symposium will discuss the implementation of the ACC conservation designation and offer contemporary research and perspectives on connectivity mitigation through wildlife friendly infrastructure development.

HARMONIZING CONSERVATION & LOCAL REALITIES: INTER-DISCIPLINARY APPROACHES TO JUST SUSTAINABILITY

Paulami Banerjee, The University of Texas at El Paso, UTEP; Michael Liles, Texas A&m University; Tarla Peterson, University of Texas El Paso; Kathryn Wedemeyer-Strombel, University of Texas El Paso; Eastern Pacific Hawksbill Initiative

One of Earth's most profound sustainability and social justice challenges is including the full spectrum of society in decision-making and actions regarding the use of natural resources. Global biodiversity conservation priorities often focus on the biological needs of species and ecosystems without concomitant attention to the needs and concerns of local human residents. The misalignment of conservation strategies and the priorities of the human population can result in exclusion of local

human residents from conservation planning. Excluding locals can escalate latent conflict and hamper desired outcomes, particularly when local residents wield power to influence the success or failure of conservation initiatives. Achieving just sustainability requires inter-disciplinary strategies that harmonize international conservation priorities with diverse realities of local communities. This requires moving beyond simply listening to local voices to actively incorporating local realities into conservation. This symposium explores how conservation strategies that promote dialogue between conservationists and primary resource users can encourage both to recognize their interdependence and create an environment of mutual respect and appreciation. The symposium's six case studies examine environmental conflicts in aquatic and terrestrial ecosystems at multiple scales, including: Community-based forest management: A case study of Joint Forest Management in India; Biting the hand that feeds you: priorities for conservation and human wellbeing in C. America; Social marketing of community managed marine protected zones in Indonesia; Action Research for co-management of inhabited protected areas in Mozambique; Challenging old models of carnivore conservation in Sweden and the United States; Fishers' Ecological Knowledge for sea turtle conservation in C. America. These approaches open spaces previously limited to resource managers, and reintegrate local communities to conservation.

HUMAN-CARNIVORE CONFLICT IN REGIONS UNDERGOING LAND-USE CHANGE

Arash Ghoddousi, Humboldt University-Berlin; Tobias Kuemmerle, Humboldt University-Berlin; Alfredo Romero-Muñoz, Humboldt University-Berlin

Human-wildlife conflict causes socioeconomic losses to people and leads to wildlife killing, both of which undermines conservation success. Important improvements regarding our understanding of the ecological, socioeconomic, and psychological factors involved in leading to conflicts or promoting coexistence between people and carnivores have recently been made. However, how land-use change, by itself the single most important driver of biodiversity loss via habitat loss, degradation and fragmentation, affects how human-carnivore interactions play out remains under-researched. This symposium explores how human-carnivore conflict and coexistence varies across different types of land-use change (e.g., agricultural expansion vs. intensification), different land-use transition stages (e.g., frontier landscapes vs. stable landscapes), and different land-use actors (e.g., smallholders vs. agri-business farmers). Finally, we will explore how addressing underlying drivers of landuse change on the supply and demand side provide opportunities for lessening human-wildlife conflict. Collectively, the symposium will highlight that a more systematic assessment of the relationships between land use and conflict is an important step for avoiding and resolving human-wildlife conflicts.

ILLEGAL WILDLIFE TRAFFICKING: FINDING SYNERGIES TO COMBAT A MULTIFACETED THREAT TO BIODIVERSITY

Alex Diment, Wildlife Conservation Society; Adrian Reuter, Wildlife Conservation Society

For most threatened species, overharvesting is the primary threat, with hunting for the illegal wildlife trade the predominant risk for many iconic species. This threat is particularly acute in Asia, but is increasingly spreading to become a global concern. Effective measures to address the trade chain, from supply through to demand, are urgently needed. This Symposium will take a wide-ranging approach to addressing illegal wildlife trade and trafficking, sharing approaches, reflections and key considerations across Asia and Latin America, from diverse sectors and a range of levels. Evidence-based interventions and methods will be presented, to identify effective means for reducing the impacts of wildlife trade and trafficking on biodiversity and wild populations. Presenters will take an interdisciplinary and inter-agency approach, and include scientists and criminologists, NGO professionals, and government officials.

INFORMATION SYSTEMS TO BRIDGE THE GAP BETWEEN DATA COLLECTION AND POLICY MAKING

Grégoire Dubois, Joint Research Centre of the European Commission

A number of large biodiversity information systems have been developed to improve the access and sharing of biodiversity data. Ideally, these data should contribute directly to decision and policy making to support biodiversity conservation. While we have been strengthening our capacity to mobilize and use biodiversity data, much remains to be done to effectively translate these data into an information that can be directly used by policymakers and decisionmakers. It is the objective of this session to address this issue by discussing and showcasing the process of transforming the biodiversity data into an information that can trigger a response from the policy makers.

INTEGRATING ECONOMICS INTO BIODIVERSITY CONSERVATION PRACTICE

Diego Lizcano, The Nature Conservancy

Economic incentives are a key tool for biodiversity conservation. Governments usually promote policies based on such incentives to mitigate or halt biodiversity loss, e.g., biodiversity offsets and payment schemes. However, careful planning in the design and implementation of incentives is required to ensure that economic benefits reach conservation targets, making their implementation particularly challenging. Furthermore, studying and understanding economic incentives frequently requires a departure from the more traditional conservation biology approaches that have historically dominated our frameworks for investigating, understanding, and managing conservation problems. The proposed symposium brings together multiple study cases, mainly from Latin America, where economic benefits have been integrated into biodiversity conservation strategies. It will provide a unique forum for cross-disciplinary learning among conservation practitioners, policy makers, and researchers that apply a diverse set of tools to merge biodiversity conservation and economics.

KEY BIODIVERSITY AREA IDENTIFICATION AND SAFEGUARD DEVELOPMENT AND APPLICATION OF THE NEW STANDARD

Thomas Brooks, IUCN; Zoltan Waliczky, BirdLife International

The 2016 World Conservation Congress marked the culmination of 12 years of work to consolidate an umbrella standard for the identification of Key Biodiversity Areas (KBAs) and launch a partnership of 11 international conservation organisations to support this identification. The process was led by a joint taskforce led by the IUCN Species Survival Commission and World Commission on Protected Areas, and built from four decades of effort to identify important sites for different elements of biodiversity (e.g., IBAs, AZEs). This new standard and partnership serve critical roles at the interface between conservation science, policy, and practice. The science underlying the standard draws from state-of-the-art techniques in biodiversity monitoring, risk assessment, and systematic conservation planning. In terms of policy, it serves central roles in implementation and monitoring of national and international instruments including Aichi Target 11 of the Strategic Plan for Biodiversity 2011–2020 and the Sustainable Development Goals 14 and 15. The practical applications of KBA identification are deeply rooted, guiding conservation action at local and national levels, investment through financial mechanisms like the Global Environment Facility and the Critical Ecosystem Partnership Fund, and safeguards under the International Finance Corporation's Performance Standard 6. This symposium, convened by IUCN and BirdLife International on behalf of the KBA Partnership, will discuss these themes of KBA science, policy, and practice, giving particular attention to assessment of the rationale for – and advantages and disadvantages of – decisions made in the process.

LAND ACQUISITIONS FOR CONSERVATION RECONCILING PLANS WITH EMPIRICAL REALITY

Christoph Nolte, Boston University

Land acquisitions are a key instrument in the conservationist's toolbox. Over the past decades, organizations and individuals have spent billions of dollars to protect habitats through the purchase or donation of full or partial land rights. The role of acquisitions for conservation is bound to increase, as climate change pushes species outside existing reserves while public park creation has stalled in many countries. Scientists have made significant progress in optimal site selection and policy design. Yet, real-life acquisitions seldom occur in "optimal" ways. Discrepancies between planning and reality are documented, but scholars rarely explain why they exist and persist. Rigorous assessments of the drivers and impacts of land acquisitions are key to understanding where acquisitions occur, why, and how they can be improved. This symposium brings together empirical quantitative analyses illuminating key aspects of the practice of land acquisition in six countries. Questions include: how and why do patterns of land acquisitions diverge from identified priorities? How can key attributes of parcels, landowners, and donors be incorporated into acquisition strategies? How do incentive policies affect rates and patterns of private land protection? Under what circumstances is buying land more cost-effective than borrowing land? Insights will inform discussions on how to narrow gaps between conservation planning theory and practice.

LEARNING FROM ACROSS THE SOCIAL SCIENCES TO INFORM EVIDENCE-BASED DEMAND REDUCTION STRATEGIES

Diogo Veríssimo, Rare/Johns Hopkins University; E.J. Milner-Gulland, University of Oxford

The unsustainable trade in wildlife is increasingly recognized a key threat to biodiversity. Efforts to mitigate the impacts of this trade have historically focused on curtailing supply through regulation and enforcement.

While the extent of success of such measures is a matter of debate, a consensus has emerged that without a focus on the demand side of the trade, any attempt to limit it to a sustainable level will fail in the long run. As influencing demand for wildlife products entails understanding and changing human behavior and societal norms, the methods needed are within the realm of the social sciences. This can be a barrier to conservationists, who may not be aware of the potential for different fields to contribute to demand reduction research and intervention. In this Symposium, we will bring together professionals from across the social sciences to showcase approaches used in their fields to influence human behaviours. Our speakers will cover academic fields such as psychology and economics, whose goal is to better understand human decisions, as well as applied fields such as social marketing, that have a wealth of knowledge on how to design, implement and evaluate behavior change interventions. By bringing together researchers and practitioners in fields that are still not well integrated within conservation science, we aim to foster a wider adoption of social science among those working to manage demand for wildlife products. The symposium will also be of interest to those aiming to influence human behaviour or better integrate social science into their research.

LINKING CONSERVATION SCIENCE TO DECISIONS IN THE REAL WORLD

Molly Cross, Wildlife Conservation Society

Bridging the gap between science and practice remains one of the greatest challenges facing the conservation community. To address this, scientists are now expected to do more than just robust research; they need to engage with multiple disciplines and sectors to collectively produce and implement knowledge into decision-making. Navigating such an engagement process is not a trivial task. Science-policy-practice interfaces (SPPIs) are often complex, requiring the capacities and needs from different stakeholders to be taken into account. Yet, the toolbox available to address such complexity is expanding. Approaches such as knowledge coproduction, mental model elicitation, adaptive management and theory of change mapping have all shown promise in recent years. This symposium will showcase and discuss the value of such tools in maximizing conservation science impact. We aim to start the session with a talk that frames SPPIs within conservation and presents the mechanisms through which each tool can help science's role in SPPI. Our speakers will then present their research projects, demonstrating the real-world application of such approaches in a diversity of conservation contexts. We aim to cover not just successes, but also failures, to promote debate during the closing discussion. All symposium participants will be encouraged to add their experiences. This structure aims to fuel a thought provoking, and needed, discussion within the conservation community. The ICCB it is a unique podium from which to reach such an audience.

LOST IN TRANSLATION: NAVIGATING COMPLEX POLICY PROCESSES TO DELIVER CONSERVATION OUTCOMES

Megan Evans, The University of Queensland

Translating policy into conservation outcomes is typically a messy and difficult process, regardless of the issue at hand or the location of concern. Existing policy systems are political and value-laden, and involve multiple actors with a range of motivations and interests. This means that scientific evidence tends not to feed into policy and practice in a neat, linear fashion, making this process challenging and often frustrating for scientists to navigate. Conservation scientists have in recent times sought to better understand how to integrate science into policy, with research on evidence-based and evidence-informed conservation, and the science-policy interface now commonplace. The current public debate about entering a "posttruth" era makes it even more crucial for conservation scientists to understand the socio-political systems in which we all operate. An interdisciplinary lens which combines political science, public policy, economics and other conservation social and natural sciences can be extremely helpful to better understand and engage with the policy process. This symposium seeks to: 1) highlight some of the complexities of engaging with and influencing policy, and where barriers to achieving conservation outcomes can exist; 2) illustrate these complexities with case studies on biodiversity offsetting, polar bear and climate change conflict, and food systems in Southeast Asia; and 3) provide some lessons drawing on these examples and the public policy literature on what are the conditions in which these barriers may be successfully navigated to lead to positive conservation outcomes.

MAPPING HUMAN PRESSURES GLOBALLY AND THE ROLE OF PROTECTED AREAS IN MITIGATING BIODIVERSITY THREATS

Enrico Di Minin, University of Helsinki; Jonas Geldmann, University of Cambridge; Michael Harfoot, Unep-wcmc & Microsoft; Lucas Joppa, Microsoft Research; Katharina Schulze, University of Amsterdam; Derek Tittensor, UNEP-WCMC; Neil Burgess, UNEP - World Conservation Monitoring Centre

It is widely accepted that the main driver of the observed decline in biological diversity is increasing human pressure on Earth's ecosystems. However, the spatial patterns of, and change in, human pressure and their relation to conservation efforts are less well known. Without understanding what is threatening biodiversity we will not be able to take the most appropriate actions to tackle them and reduce the rate of biodiversity loss. This symposium is divided in to 3 themes. In the first theme, we will explore "the gold standard" for threat maps and how to move past the current paucity of threat data. The second theme will highlight three novel approaches to understand the distribution of human pressure. The first talk will use methods derived from citizen science, to spatially map pressures to biodiversity based on the threat status of ca 15,000 species in the IUCN red list. The next talk will focus on identification of global hotspots of Red-listed species threatened by one of the most important and most poorly mapped threat: exploitation of biological resources. The third talk will use CITES trade data combined with data border seizures to shed light on the relationship between legal and illegal trade. The last theme will showcase the role of protected areas in mitigating pressure and reduce threats to biodiversity, using data from ca. 2,000 protected areas. The first talk will explore geographical differences in the threats as well as driver associated with highly threatened protected areas. The final talk will be a global analysis of protected area effectiveness in terms of reducing human pressure as well as what factors are contributing to their success and failures. The discussion will explore the policy relevance of the results presented and what data and tools are needed to improve our understanding of threats to biodiversity.

MIND THE GAP AN OPEN- SCIENCE NETWORK FOR INTEGRATED ECOSYSTEM RESEARCH IN COLOMBIA

Maria Londoño-Murcia, Instituto Alexander von Humboldt; Bjorn Reu, Universidad Industrial de Santander; Lina Estupinan-Suarez, Instituto de Investigacion de Recursos Biologicos Alexander von Humboldt; Juan Posada, Universidad del Rosario

Colombia is experiencing a tremendous societal and economic transformation with unknown consequences for its biodiversity and ecosystems. While rates of change of land cover and climate have reached unprecedented velocities, information about the state of Colombian ecosystems is becoming increasingly available and openly accessible. However, these data are often heterogeneous, dispersed, and difficult to access. Moreover, the monitoring efforts in Colombia occur at different sites and timing. In order to respond to the challenges of rapid ecosystem transformation in Colombia, we invite you to join this initiative for an open science network for integrated ecosystem research, and share your research experience from a multiscale and transdisciplinary perspective. This will foster the discussion about establishing an ecological observatory system for monitoring important ecosystem variables such as climate, biogeochemistry, biodiversity, and socio-economic drivers. We are interested in understanding not only local ecosystem process, but also interactions between the biosphere and atmosphere; how these are affected by human activities and do affect ecosystem services and human wellbeing. The symposium aims to: Show data platforms and compile new initiatives that investigate ecosystem functioning across disciplines; Foster the exchange of experiences on studying ecosystem change in Colombia, and merge activities for a more complete understanding of ecological process and drivers; Discuss the formation of an emerging network/platform on open ecosystem science.

MONARCHS, PANGOLINS AND VAQUITA: USING U.S. LAWS TO LEVERAGE GLOBAL CONSERVATION GAINS

Brett Hartl, Center for Biological Diversity

The United States' domestic environmental laws provide many tools to promote conservation objectives both within and beyond its borders. For example, in 2016 the Obama administration finalized a set of regulations that will likely prevent the deaths of 650,000 marine mammals worldwide each year by requiring that every nation which seeks to import seafood into the United States meet with the strict, protective standards of the Marine Mammal Protection Act. This symposium will examine several case studies where U.S. environmental laws and policies have been leveraged in creative ways to address some of the most urgent issues in conservation today. This symposium will, among other things, discuss (1) how the Endangered Species Act is being used to address international wildlife trafficking of species including pangolins and African elephants, (2) how fisheries and trade policies are being employed to protect the critically-endangered Vaquita by addressing the illegal Totoaba swim-bladder trade, (3) how a combination of U.S. laws and international treaties are being used to protect the monarch butterfly across its migration, and (4) how migratory birds are protected on their wintering grounds and during their migration through U.S. funded conservation programs. Finally, this symposium will review the first six months of the Trump administration and what early policy changes likely mean for biodiversity conservation both in the United States and abroad.

MONITORING INVISIBLE PLACES: ECO-ACOUSTICS IN MARINE AND FRESHWATER ENVIRONMENTS

Simon Linke, Griffith University

This interdisciplinary session will focus on acoustic monitoring in rivers, lakes and oceans - environments in which biodiversity and condition monitoring has proven even more difficult than their terrestrial counterparts. Traditional methods of aquatic survey techniques a) bear risks to the health of the organisms, b) introduce bias and c) only assess populations at single times instead of continuously and d) incur high costs, particularly in remote areas. Acoustic monitoring - a noninvasive, continuous real-time technique can address all of the above issues. So far mainly discussed at specialist conferences, this session will review progress and challenges in this new field, with three talks each about marine and freshwater projects from France, Ireland, Australia and Africa. The session is pitched at both the growing number of ecoacoustic researchers and practitioners in SCB, but also at conservation practitioners who want to learn more about using underwater acoustics as a monitoring tool. After an introduction into freshwater eco-acoustics, we will discuss spatio-temporal sampling problems for freshwater monitoring - a talk later matched by a marine presenter. The remaining three talks introduce examples in automatic detection of single aquatic species, soundscape monitoring as well as study design - three key considerations in bioacoustics. All major groups of soniferous aquatic organisms will be covered: Cetaceans, fish and invertebrates.

MORE PEOPLE COME TO THE OCEAN: DATA ON INCLUSIVITY IN MARINE CONSERVATION SCIENCE

Clare Fieseler, UNC Chapel Hill

Science is inherently a hierarchical community but it doesn't follow that access to conservation science, dialogue and professional opportunities should be restricted to the same organizational structure. It is well-documented that diversity and inclusivity improves the quality of scientific research. If our conservation science spaces are inaccessible, then the work that we do to support Earth's biodiversity will suffer as well. At a time when societies, such as the Society for Conservation Biology, are working to increase diversity within membership, we must do whatever we can to understand the state of diverse opinions, people, and spaces in our field. We must also understand where barriers exist and how they can be removed. This symposia, organized by board members of the Marine Section of the Society of Conservation Biology, aims to present new data and case studies about inclusivity trends among marine conservation science collaborations, professional engagement, and advocacy arenas. The five data-driven presentations serve as a springboard for a 15-minute discussion on how to address knowledge gaps on conservation science inclusivity with scholarly research and SCB programming. The symposium complements a subsequent symposium organized by the SCB Marine Section, "More Problems Come to The Ocean: Emerging Issues in Marine Conservation Science."

MORE PROBLEMS COME TO THE OCEAN: EMERGING ISSUES IN MARINE CONSERVATION SCIENCE

María De Lourdes Martinez Estevez, UNAM/UCSC

Once considered as an infinite source of goods and services, oceans face the highest rates of extraction with the subsequent loss of species, degradation of ecosystems and the decline in the provision of services for human beings. The Marine Section of the Society for Conservation Biology promotes scientific research and public policies, supports the inclusion and diversity, encourage interdisciplinary work, and disseminates, through education, the importance of the oceans. Although our efforts seem insufficient in the face of new threats and the pace of degradation, the discussion of different approaches to solve them is a good way to identify the future direction of the section and the improvements needed in the marine conservation realm. This symposium seeks to explore the issues that impact the effectiveness of marine conservation, and to discuss the initiatives that bring solutions to conservation problems. The session brings together specialists whose work in these subjects will give us a better understanding of different approaches to increase the long-term conservation gains, from the perspective of different actors and at different scales.

NEW CONSERVATION STRATEGIES TO SUSTAIN CORAL REEFS UNDER CLIMATE CHANGE

Kenneth Anthony, Australian Institute of Marine Science; Gabby Ahmadia, World Wildlife Fund

Coral reefs are the rainforests of the sea and nature's food stores in the tropics. Their services to humanity are more valuable than most global businesses. But climate change will place unprecedented pressures on coral reefs and the values they provide to society. To sustain coral reefs and dependent people through the climate crisis will require conservation strategies that explore a broader range of approaches than usual, including radical and high-risk/high-reward options. The symposium presents

contributions from conservation practitioners, scientists and other outside the-box thinkers. The symposium explores innovative solutions that include genetic rescue, reef design, restoration, and new conservation models. 1. The new conservation challenge for coral reefs. This introduction will lay out the paradigm shifts needed and how presentations will integrate under a broader solutions framework. 2. Integrating climate risk and refuge into data-driven conservation portfolios for Indo-Pacific coral reefs. The talk will present a decision tool to support the design of climate-smart conservation plans for coral reefs. 3. Reef resilience challenges to deliver critical ecosystem services in the Coral Triangle. Talk explores the challenges and opportunities for sustaining key fisheries species and tourism values. 4. How human responses to climate change impact biodiversity. The speaker presents examples of how shifts from farming to fisheries in drought-stricken regions can degrade reef systems. Interventions are proposed that help communities adopt sustainable alternatives. 5. Reef resilience through assisted evolution – can we climate harden the reef engineers? Talk proposes a suite of restoration techniques to increase the adaptive capacity of key coral reef species. 6. Time for triage: which reef conservation objectives do we prioritize? Climate change will force reef managers to trade some conservation objectives off against others.

NEW TECHNOLOGIES FOR NOVEL CONSERVATION SOLUTIONS

Barbara Bollard Breen, Auckland University of Technology

Conservation researchers and practitioners are increasingly turning to technology to develop novel, interdisciplinary solutions to conservation challenges. As such, the field of conservation technology is rapidly expanding around the world. Conservation technologies provide accessible and cost-effective tools to improve monitoring, encourage stakeholder participation, and improve decision-making processes. In addition, the rapid increase in conservation technology has encouraged our capacity to innovate, problem solve, experiment, learn, and collaborate. As a result, conservation technology is changing the face of conservation. In this symposium we explore a range of different conservation technologies, and discuss how these technologies provide new opportunities for us to achieve our conservation goals. Talks will cover a range of technologies, including conservation drones, remote sensing, interactive data visualisation, virtual reality, augmented reality, gaming, and how mobile phones can be used to improve conservation management. As the scope and potential of conservation technology continues to expand, there has been no better time to explore how these innovations can help us address key conservation challenges and deliver effective conservation outcomes.

NEW TOOLS FOR ECOSYSTEM ASSESSMENT AND MONITORING

Lucie Bland, The University of Melbourne

Developing ecosystem indicators to assess progress towards the Aichi 2020 Targets remains a challenge, as ecosystems are complex in nature, scale-dependent, and data-intensive to monitor. Integrating long-term field studies and remotely-sensed data, together with a conceptual understanding of ecosystem processes and drivers of change, can provide a powerful basis for quantifying ecosystem change. This symposium focuses on new tools for tracking the status of ecosystems, including Essential Biodiversity Variables for ecosystem structures and functions developed by GEO BON (Group on Earth Observations Biodiversity Observation Network) and IUCN Red List of Ecosystems risk assessments. By showcasing case studies from a wide range of ecosystems – from the Meso-American Reef to forests of eastern Australia – the symposium will illustrate common challenges and solutions in ecosystem monitoring schemes. We will address the need for consistent ecosystem classifications, a strong understanding of ecosystem processes, wise selection of indicators, and implementation of predictive models for monitoring ecosystems from local to global scales. These advances promise an evidence-based monitoring process for ecosystems that will further enhance our ability to assess progress towards Aichi targets and support ecosystem conservation.

OTHER EFFECTIVE AREA-BASED CONSERVATION MEASURES ADVANCES IN COLOMBIA

Carlos Arturo Saavedra Sr., Wildlife Conservation Society

The Aichi target 11 specifies that by 2020 at least 17 per cent of terrestrial and inland water and 10 per cent of coastal and marine areas are conserved through effectively and equitably managed ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures and integrated into the wider landscapes and seascapes. However other effective area-based conservation measures OECM was not yet clearly defined by the time this target was adopted impeding the countries to report advances on this respect. Therefore efforts lead by IUCN have been focused on providing guidelines on the meaning of the term which have been recently released and are under evaluation with case studies from all over world. The aim of the symposium is to present the advances on this topic in Colombia through the analysis and discussion

of several case studies identified in coordination between governmental institutions privates and non-profit organizations. These studies show the diversity of conservation initiatives and their particular contexts allowing to test OECM criteria for identify the need for adjustments and recommendation to the guidelines.

PROVIDING SOLUTIONS TO CURRENT CONSERVATION CHALLENGES WITH NOVEL GENETIC APPROACHES

Melanie Murphy, University of Wyoming

Current conservation challenges in conservation biology include managing species in fragmented landscapes, maintaining or restoring functional connectivity, controlling hybridization risk, estimating critical demographic parameters for long-lived species on a time-line relevant for conservation and alleviating negative consequences of inbreeding. Interdisciplinary approaches that incorporate cutting-edge genetic tools can address these key questions in conservation science. Our symposium will address a range of conservation questions from single species conservation to landscape-level preservation of biodiversity and from genes to communities. In addition, we present a broad-range of contemporary genetic methods that can be leveraged to address the greatest conservation challenges of our time: environmental DNA, noninvasive sampling, novel analytical approaches and next-generation sequencing. We will demonstrate how genetic approaches can inform and catalyze conservation action with local, national and international examples.

RED LISTS OF ECOSYSTEMS IN LATIN AMERICA FROM NATIONAL EFFORTS TO A REGIONAL STRATEGY

Irene Zager, Provita; José Ferrer Paris, Ivic

Risk assessment is an important tool for informing biodiversity conservation and represents one step in the process of setting conservation priorities for future actions, as well as informing efforts aimed at meeting international goals such as the Aichi Biodiversity Targets and the UNDP Sustainable Development Goals. The IUCN Red List of Ecosystems (RLE) proposes a unified risk model with standard, transparent and repeatable criteria for addressing the risk of ecosystem collapse equivalent to the one used by the Red List of Threatened Species. Recently several RLE assessments have been completed in Latin America through national and subnational initiatives based on locally described but internally consistent classifications. However, a broader strategy is needed in order to scale-up these efforts and advance toward a global assessment of the world's ecosystems. This regional strategy must address methodological and conceptual challenges in order to bridge the gaps that arise between countries due to uncertainties in unit definitions and delimitation, the use of alternative sources of data, and divergent approaches for the calculation of changing attributes of ecosystems. We will present the results of recent developments in ecosystem risk assessment in Latin America with contrasting examples, from continental analysis based on regional vegetation units and broad ecosystem definitions, to national and subnational assessments focused on locally described but internally consistent classifications. We will close the session with an outlook of the role that the RLE can play in international and national policy. After the presentations, we will discuss the strengths and weaknesses of the different approaches, and draft guidelines for future steps toward a better integration of national and regional efforts.

RURAL COMMUNITIES AND INDIGENOUS PEOPLES CONTRIBUTIONS TO THE CONSERVATION OF THE AMAZON BASIN

Zulema Lehm, Wildlife Conservation Society; Robert Wallace, Wildlife Conservation Society

In the 1980's conservation science proposed a new theoretical and practical "paradigm" called Community-based Conservation, contrasting with the more traditional conservation approach "without people". Since then a broad "rainbow" of associated theoretical, methodological and practical tools have been developed, and new data highlights the importance of communal rural systems on the access and use of land and biological diversity. Globally, it is estimated that more than a half of terrestrial land is held by these traditional systems, however, their social and economic importance is not fully appreciated. Protected areas and indigenous territories cover 45.5% of the Amazon Basin, of which 28.1% corresponds to indigenous territories. Deforestation between 2000 and 2013 is less in indigenous territories (0.8%) than in protected areas (1.1%) and between both, markedly less than the rest of the Amazon (3.6%). The objective of this symposium is to highlight and discuss which models have worked better, which have failed, what capabilities are required, and which conditions are necessary for successful community-based territorial management models. Presenters will detail traditional access and use systems employed by different kind of Amazonian rural and Indigenous Peoples, as well as new strategies that they are applying to use and conserve their lands and territories in the 21st century.

SEASONALLY DRY FOREST CONSERVATION IN THE NEOTROPICS

Santiago Madriñán, Jardín Botánico de Cartagena

Seasonally Dry Tropical Forests are amongst the most endangered ecosystems on Earth. It is estimated that ca. 10% of the original extent of SDTF in the Neotropics remains. In the Colombian Caribbean region, SDTF are particularly endangered through expansion of urban areas and a long history of occupation and destructive land use practices, such as conversion to pastures for cattle ranching and urbanisation. In this symposium we will explore conservation strategies of SDTF through five presentations by leading personalities in the field including: 1) an overview of current state of SDTF in the Neotropics (biodiversity, land use, conservation, threats); 2) climate history and future climate change scenarios in SDTF; 3) landscape analyses of extant SDTF; 4) preservation and ecological restoration strategies of SDTF conservation, and 5) economics of SDTF conservation and sustainability through ecotourism, silvopastoral models, community involvement and REDD+ strategies. At the end of the oral presentations there will be a 15 min roundtable inviting the presenters and participants to comment of drivers of SDTF change and solutions to leading towards its conservation.

SHAPING THE FUTURE OF CONSERVATION TECHNOLOGY

José Lahoz-Monfort, University of Melbourne; Matthew McKown, Conservation Metrics, Inc.; Shah Selbe, Conservify

Technology has great potential to revolutionize the way we collect data on species and habitats, and provide new tools to support conservation action. We believe the time has come for conservation to move from being technology consumer to become an innovation leader and to actively seek to design novel technologies and devices to suit our specific needs. The invited talks of this symposium provide an overview of where we stand in terms of conservation technology, and explore the key gaps that need to be addressed to achieve its full potential as a transformative tool.

STATUS OF BUSHMEAT EXPLOITATION AND TRADE IMPLICATIONS FOR BIODIVERSITY CONSERVATION

James McNamara, The Breakthrough Institute; John Fa, Durrell Wildlife Cnsrvtn Trust; Yaa Ntiamoa-baidu, University of Ghana; Evi Paemelaere, Panthera; Dafna Angel, Panthera

The exploitation of bushmeat for food and trade represents a severe ecological crisis for both people and nature. Finding solutions will require innovative interdisciplinary approaches that bring together experts from various disciplines to understand both the ecological and human dimensions of the problem. This symposium will present the latest research into the drivers of the bushmeat trade from leading researchers in the field, using long-term, decadal data sets to explore the spatial, economic and socio-ecological drivers of the trade. A diverse range of issues will be examined, from the geospatial dynamics of commercial hunting systems in Ghana, to the processes that underpin the hunting strategies of indigenous pygmy groups in Central Africa, and the driver of demand and consumption of bushmeat in Gabon. We close the session with an overview of the latest global trends in hunting-driven mammal declines that highlight the perilous ecological crisis that the bushmeat trade represents if left unmanaged. The session will bring together researchers to share new insights and methodologies and encourage the development of key partnership to provide a strategic front in seeking solutions to bushmeat harvesting.

SUCCESSFUL SCENARIO PLANNING

Hedley Grantham, Wildlife Conservation Society; Sean Maxwell, The University of Queensland

Scenario planning is a rare example of science bridging the implementation gap. Originally used by governments and businesses to improve their long-term decision-making, scenario planning is now being applied to address conservation challenges. But care must be taken to ensure that a wider application of the approach is met with a complete understanding of its strengths and weaknesses. Scenario planning resonates with laypeople because it can evaluate trade-offs between conservation, development and societal goals, and thereby allow more transparent and robust management decisions to be made. Successful scenario analysis is interdisciplinary, requiring expert elicitation, modelling and dissemination skills, and often requires forging new research collaborations. This symposium will present a scenario planning masterclass, detailing six case studies where the approach has solved conservation challenges on the ground. Case studies will cover interactions with government, nongovernment and public stakeholders, and involve three major conservation challenges; threatened species management, the delivery of ecosystem services and climate change adaptation. The aim of the symposium is to provide an improved understanding of scenario planning methodology, as well as the benefits and pitfalls of the approach. The symposium presentations will be followed by an open

discussion, which is designed in part to facilitate new research collaborations between audience members seeking to conduct their own scenario planning analysis.

TACKLING OVER-COLLECTION OF WILD PLANTS; IS HORTICULTURE A CONSERVATION PROBLEM OR SOLUTION?

Lauren Gardiner, Conservation Science, Royal Botanic Gardens, Kew; Amy Hinsley, University of Oxford

Although much conservation attention is paid to charismatic megafauna, one in five of the world's almost 400,000 plant species is threatened with extinction. Of those, IUCN data shows that more than 20% are directly threatened by collection from the wild for subsistence use or trade, including for food, building materials, medicine and as ornamental plants. Horticultural techniques that have been developed over thousands of years to grow crop plants and living collections in botanical gardens have long contributed to the ex situ conservation of plants around the world. Yet horticulture can also be a threat: many rare plant species have been collected to extinction for the horticultural trade, and encouraging propagation of useful plants is an often suggested solution to over-collection, but one that may actually increase wild-collection. This symposium will bring together experts from research and practice to present experiences and viewpoints, from different disciplines, of the role of horticulture in preventing over-collection of wild plants and securing their representation in ex situ collections. Speakers will include anthropologists working on sustainability of subsistence use, botanists and conservationists who specialise in different groups of threatened plants, as well as practitioners who work closely with horticultural traders and corporations using wild plant material.

TENURE SECURITY AND NATURE CONSERVATION A DRIVER OR SOLUTION FOR CONSERVATION

Yuta Masuda, The Nature Conservancy

Land tenure insecurity can hinder conservation and human well-being goals, especially in many developing and tropical regions where conservation concerns are often highest. Land tenure security underpins the success many multilateral policy initiatives, including Reducing Emissions from Deforestation and Forest Degradation, the United Nations' Sustainable Development Goals, the Convention on Biological Diversity's Aichi Biodiversity Targets, and the International Platform for Biodiversity and Ecosystem Services. The conservation sector is now thinking about whether and how to better incorporate land tenure strategies into their work with an eye towards increasing conservation and human well-being. Yet the ways in which land tenure security interacts with conservation initiatives, large and small, remains poorly understood and implemented. Greater clarity and evidence is needed to unpack the complex relationship between tenure security, conservation, and human well-being. Insights from this work have important implications for understanding when and how tenure insecurity drives, or is a solution to, conservation challenges. This symposium draws on scholars and practitioners from diverse fields to spur new ideas on how incorporating tenure security can advance conservation science, practice, and policy.

THE FUTURE OF CONSERVATION ONE MOVEMENT OR MANY

Janet Fisher, University of Edinburgh; George Holmes, University of Leeds; Chris Sandbrook, UNEP World Conservation Monitoring Centre

The last few years have seen the re-emergence of heated debates among conservationists regarding the rationales, objectives and approaches of conservation. These debates reveal the strong divergence of views within the conservation community, and have triggered secondary discussions about how to handle such differences of opinion and objective. Some have argued that conservation should be an inclusive movement that embraces diversity whilst maintaining a united front. Others have argued that diversity of views demands open discussion and 'agonistic pluralism', and even possibly the fragmentation of the wider movement into multiple movements and foci. This symposium will bring together voices in this debate to consider new empirical evidence regarding the views held by conservationists and the extent to which shared ways of thinking can be identified amongst a 2015 study of ICCB participants and the findings of the broader 'Future of Conservation' survey. We will use this as a platform to discuss the merits and demerits of conservation fragmenting or coalescing and we will hear a perspective about the importance of the conservation movement incorporating and fostering diverse perspectives. We will also examine lessons from particular areas of conservation (the illegal wildlife trade) and a large-scale study of the conservation attitudes and behaviours of Millennials in populous countries. The symposium will comprise five speakers drawn from different disciplinary backgrounds, and will conclude with a moderated debate involving the audience, which will allow for the wider discussion of issues raised during the presentations.

THE IMPACT OF EARTHS CHANGING HUMAN FOOTPRINT ON BIODIVERSITY AND HUMANITY

Kendall Jones, University of Queensland

Humanity and nature forms a coupled system and anthropogenic pressures on the environment have profound impacts on biodiversity, social equality and economic prosperity. Understanding how and where changes in human pressures have occurred is vital not just for biodiversity conservation but also our understanding of essential ecosystem service provisioning. Until recently, global assessments of human pressure change have been limited in that they have focused solely on single measures of human pressure, such as forest loss. But recent advances in cumulative impact mapping have profoundly changed this, as they simultaneously capture the impacts of numerous human activities across space and time, and demonstrate huge recent increases in human pressures globally. This symposium will utilise these advances to present novel methods for measuring the impacts of human pressure on biodiversity and ecosystem services and explore the possibility of reconciling human development and biodiversity goals. We will explore the relationship between human pressure change and socio-economic change over the past two decades, asking the question: Can economic growth and human development be decoupled from biodiversity loss? Second, we will highlight advances in mapping human impacts to biodiversity. Finally, we will investigate how human pressures are affecting conservation efforts globally, assessing the effectiveness of protected areas for mitigating human pressures, and highlighting areas where human pressures compromise abilities to meet international environment targets.

THE IUCN RED LIST AS A TOOL FOR CONSERVATION ACTION IN LATIN AMERICA

Thomas Lacher, Texas A&M University

Recent research has documented the global decline in biodiversity and media outlets have communicated these concerns to the public. The emphasis has historically been on "charismatic megafauna", primarily large mammals and birds; other lesser-known groups receive little publicity and relatively little financial investment. However, many of these overlooked groups serve critical roles in maintaining functional tropical ecosystems, and can serve as more sensitive indicators of habitat degradation and climate change. Small species also often have restricted ranges, high levels of habitat specificity, and are more susceptible to extinction than wider ranging larger species. In addition, small species are vulnerable to local scale drivers that can be ignored with larger species. Their conservation therefore will require emphasis on local, community driven actions that require interdisciplinary solutions. We will discuss the value of the IUCN Red List as a tool for addressing conservation action, and use example assessments of species of smaller body size, smaller geographic distributions, and higher sensitivity to disturbance. We follow with the importance of addressing climate vulnerability into the assessment of these groups. We argue that our focal species have high value in designing local or national conservation plans, and can lead to more effective site-specific conservation actions.

THE ROLE OF FOREST PLANTATIONS IN BIODIVERSITY CONSERVATION

Gabriel Castaño, Universidad de Caldas; Francisco Fonturbel, Pontificia Universidad Catolica de Valparaiso

Forest plantations are increasing worldwide, covering thousands of hectares across countries and ecosystems. Originally forests plantations were considered as green deserts, but recent evidence showed that some plantations could provide habitat for many native animal species. However, our understanding about the actual value of forest plantations for conservation is more focused on patterns rather than processes. The purpose of this symposium is to discuss the role of productive and protective forest plantations in conservation and management endeavors. Then, we will approach the discussion from three points of view: global changes in biodiversity associated to forest plantations, ecological interactions and evolutionary processes, and functional diversity. Focusing research on the ecological and evolutionary processes underlying forest plantations would improve our knowledge about its actual and future value for conservation, going beyond than species richness. After the presentations, we will have a joint debate to stimulate discussion on this subject between the presenters and the audience.

THE ROLE OF NATURAL HISTORY MUSEUMS IN SUSTAINING BIOLOGICAL AND CULTURAL DIVERSITY

Nora Bynum, Field Museum

Conservation efforts are structured in various ways in these collections-based institutions, which often have a distinct public profile, serve as trusted conveners in science and education, and have breadth and depth in intellectual and physical resources. This symposium addresses the spectrum of conservation strategies that museums undertake, such as deploying knowledge from collections in conservation research; using biological and social inventories to direct conservation action; developing citizen-science programs

that engage communities from local to international scales; and building capacity for diverse target audiences. We also will discuss the role of fundamental biodiversity research and how it complements and differs from conservation action; how we measure the success of biological conservation efforts and cultural engagement; how we evaluate quality of life; and how we look to a future with a global community of museums working on conservation, removing barriers to collaboration among these institutions.

THE STATE OF SOCIAL-ECOLOGICAL SCIENCE IN ENVIRONMENTAL NGO PRACTICE: A SSWG SPONSORED SYMPOSIUM

Catherine Christen, SCBI; Rebecca Garvoille, Denver Zoo

Recent scholarship discusses the state of socialecological science (SES): research that integrates the social and natural sciences to address current conservation challenges and their drivers across the globe. This literature offers recommendations to scientists on how to more effectively approach these kinds of interdisciplinary collaborations. For example, Moon and Blackmon (2014) encourage natural scientists to learn more about the philosophical principles and theoretical assumptions of social science disciplines. However, there is limited understanding about how these SES insights are being applied at the project-level across environmental non-governmental organizations (ENGOs), and if ENGO experiences with SES differ from theory. Environmental NGOs operate at local-to-global scales, focus on concrete actions to conserve biodiversity, are mission-driven and have varying resources. This symposium addresses key questions pertinent to ENGO practice: What does it take to effectively integrate the natural and social sciences in conservation projects across the spectrum of ENGOs? How do problems of understanding, philosophy, capacity and method play out in ENGO projects? From an ENGO perspective, what are the limits to a SES approach? What do ENGO social scientists think about the efficacy of SES approaches? ENGO scientists leading SES projects will discuss their experiences and provide recommendations on advancing interdisciplinary conservation solutions in an era of rapid global change.

THE URBAN CHALLENGE: LATIN AMERICAN CITIES AS HOTSPOTS OF OPPORTUNITIES FOR BIODIVERSITY CONSERVATION

Juan Amaya-Espinel, Pontificia Universidad Javeriana; Juliana Montoya, Instituto Alexander von Humboldt

The accelerated rate of urban growth in Latin America represent a contrasting duality of challenges and opportunities for the biodiversity conservation. First, for the negative effects that this process could have on the structure and functioning of natural ecosystems, the survival of multiple groups of fauna and flora and their participation in ecosystem services delivery closely linked to the urban dwellers wellbeing in this development countries. But on the other hand, also for the significant opportunities that these cities could be still offering for reducing the rate of biodiversity loss in this part of the world. The growing interest for address these challenges and opportunities for biodiversity conservation in Latin American cities has been promoting an increasing series of descriptive studies and quantitative analysis. In addition to process to incorporate biodiversity as a strategic element in processes of urban planning and environmental management. This symposium seeks to present current advances towards integral conservation of biodiversity in Latin American urban areas. To achieve this goal, a series of presentations and a panel discussion about conceptual and practical developments will be promoted, as well as various case studies to address comprehensibly the ecological, social, economic and political aspects that converge around the conservation of biodiversity in cities of Central and South America. This symposium will contribute to a better understanding of the importance of cities into the Neotropical biodiversity conservation and what role must to play conservationist, urban planners as well as decision makers to guide actions and policies needed to accomplish this purpose.

USING INTERDISCIPLINARY FRAMEWORKS TO ADDRESS CORAL REEF CONSERVATION

Fraser Januchowski-Hartley, Institut de recherche pour le développement; Dominique Pelletier, IFREMER

Coral reefs are an ecosystem under great threat, exposed to numerous complex stressors. Complicating how stressors can be tackled, is the tendency to investigate or address factors such as ecology, physiology, governance, poverty, gender, culture and social hierarchies in isolation, often treating other aspects of coral reefs as a "black box", with little acknowledgement of the dynamics operating outside of the direct field of interest. To address and solve the challenges these stressors pose in an equitable manner that ensures long-term success, coral reef conservation needs to expand its repertoire of tools beyond reserves and fisheries restrictions. This will only be achieved through a truly inter-disciplinary approach acknowledging the dynamics and complexities of each field. This symposium aims to bring together researchers and practitioners currently working on coral reefs from social, biological and conservation science backgrounds, to discuss what the current challenges and opportunities are in coral reef conservation, and how we can leverage

interdisciplinary research to most effectively address these. The presentations will focus on practical, interdisciplinary, applied work, setting the context for a panel discussion and dialogue. This dialogue will specifically involving conservation practitioners and researchers that approach reef conservation predominantly from the biological or from the social, as well as inter-disciplinary researchers to identify opportunities, and to share experiences of stumbling blocks and how these can be best avoided.

WHAT ARE THE TRIGGERS FOR PEOPLE TO CHOOSE A SUSTAINABLE LIFESTYLE?

Karla Pelz Serrano, Universidad Autónoma Metropolitana Lerma; Rurik List, Universidad Autonoma Metropolitana; Patricia Manzano Fischer, UAM Lerma

In the last 100 years humans have damaged the Earth more than ever since Homo sapiens started its evolutionary path. However, besides the technological advances from this last century, there is one primary factor of environmental degradation which can be addressed at the individual level: the lifestyle. Earth will not be able to sustain the lifestyle most people is having or aspiring to have. It is well documented that if we do not change our daily habits, if we do not reduce our ecological footprint, upcoming generations or even current ones will not have access to the same resources we have today. As conservationists, we have a huge responsibility of being role models for people that do not have the information we do. We need to be consistent with what we preach. If we, conservationists do not have a more sustainable lifestyle, what can we expect from people that are not aware of the consequences of our daily choices? We need to understand which are the triggers that promote changes in people to adopt more sustainable lifestyles. The objective of this symposium is to explore different scenarios or cases, from rangeland, fisheries, economics, consumerism and psychology, in which conservation strategies have worked to change people's choices for different and more sustainable practices. To try to understand what are the strategies or tools used to change people's actions towards a more sustainable lifestyle. This will be a forum to discuss what are the approaches that have worked in specific cases, and how can be applied in a daily life.

WHAT ARE WE WILLING TO LOSE? REFRAMING ADEQUACY TO ACHIEVE CONSERVATION OUTCOMES

Hugh Possingham, The University of Queensland; James Watson, Wildlife Conservation Society; Caitlin Kuempel, University of Queensland

The term adequate is defined as "satisfactory or acceptable in quality or quantity", and in conservation terms, often refers to the ability of biodiversity features (i.e., species, habitats, etc.) to persist into the future. Adequacy remains one of the most challenging conservation principles to implement and measure. Growing interest in campaigns which advertise that "nature needs half" expose the fact that we still do not know how much is enough to conserve the world's biodiversity. It is both remarkable and alarming that such a fundamental question remains not just unresolved, but so poorly answered. It is certain that anything less than 100% of effectively protected area will be inadequate to halt biodiversity loss at all levels. However, 100% protection is not a practical or realistic goal, particularly since nearly all area on earth has been impacted by human use. Instead of thinking about how much area we need to protect, which has a very high likelihood of falling short, why are we not asking: what can we absolutely not lose? By using this approach, we will be forced to ask the equally important and equally difficult question: what are we willing to lose? Considering that under current conservation commitments (e.g., Aichi Target 11) we are destined to lose 83%, it is important we start to consider what this might entail. With the proposed series of talks, we aim to 1) synthesize the existing state of adequacy in conservation science, 2) discuss key issues for making decisions about gains and losses for biodiversity, and 3) explore the implications of reformulating the current approach to adequacy on halting biodiversity loss.

WHAT IS HINDERING THE SUCCESS OF CONSERVATION TRANSLOCATIONS?

Oded Berger-tal, Ben-Gurion University of the Negev

Translocations are a common conservation and management strategy, but despite their popularity, translocations are a high-cost endeavor with a history of failures. It is therefore imperative to maximize the success of translocations by learning from past successes and failures. We reviewed the IUCN's Global Re-introduction Perspectives Series, making use of its highly structured format to extract all the difficulties that were reported by wildlife managers to hinder the success of their translocation programs. The over 1,000 difficulties reported provide an invaluable examination of the common "spokes in the wheels" of this popular management tool. In this symposium we will review these difficulties and then explore five of the most common ones encountered by wildlife managers translocating animals for conservation purposes – monitoring difficulties, animal behavior issues, lack of public support, predation, and diseases. Each of the talks will offer possible solutions that

can alleviate these difficulties and increase the chances of translocation success. The symposium is aimed at giving wildlife managers applicable tools that would help them in preparing future translocations programs.

WILDLIFE CRIME BRIDGING THE GAP BETWEEN CONSERVATION SCIENCE AND CRIMINOLOGY PART I

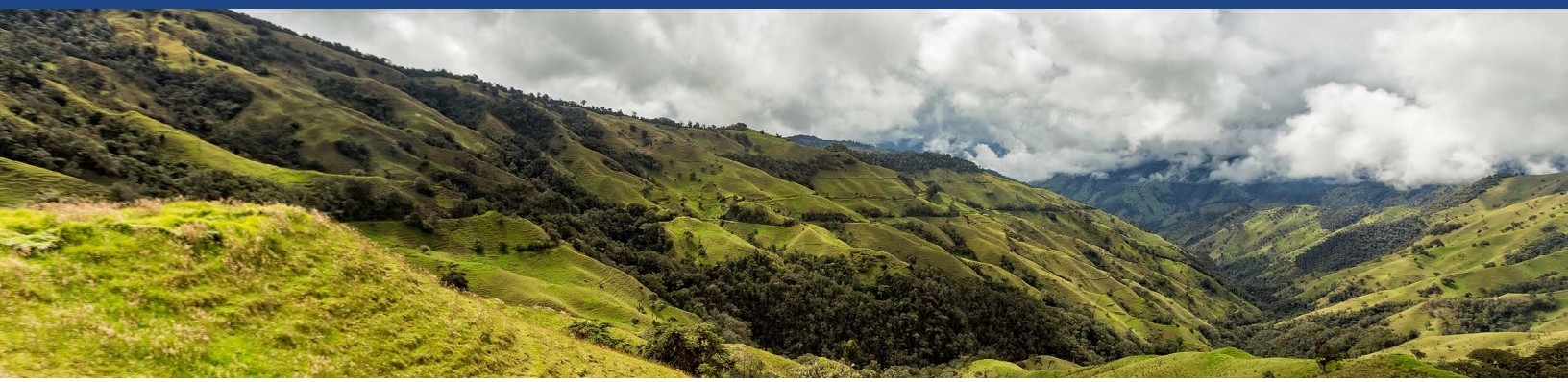
Justin Kurland, Rutgers University

Wildlife crime—and the various forms of poaching in particular—threatens both local and global populations of particular species with extinction. To date, those with backgrounds in the biological sciences have conducted the majority of the research on wildlife crime. However, theories and methods for addressing illegal behavior from the social and mathematical sciences have much to offer in examining wildlife crimes. More specifically, the session will explore how criminologists, and those from other disciplines, might improve conservation efforts by analyzing various types of poaching to determine where, when, how, and what is being targeted. The papers seek to identify patterns and the underlying opportunity structures involved that make them amenable to prevention. This is Part I of a series of symposia and a workshop on wildlife crime that will be cross-branded by the social sciences working group. Part I focuses on the spatio-temporal aspects of flora and fauna poaching, Part II focuses on illegal trade, trafficking and consumer demand, and Part III focuses on human-animal conflict. Across the three sessions we have secured a 50:50 speaker gender ratio, with representation across five continents, a mix of academics and practitioners, and a Stockholm Prize winner (the Nobel Prize of criminology).

WILDLIFE CRIME BRIDGING THE GAP BETWEEN CONSERVATION SCIENCE AND CRIMINOLOGY PART II

Matthew Holden, University of Queensland

The increasingly interconnected global economy has made it possible to rapidly supply consumer demand for wildlife products around the world, threatening both local and global populations with extinction. Because management actions to conserve such species ultimately require changes in human behavior and can have profound impacts on human livelihood, research towards solving the illegal wildlife trade crisis must cross disciplines from traditional ecologically focused research into the social and mathematical sciences. In this symposium, we propose tools, frameworks and potential solutions to curtail illegal wildlife trade borrowing heavily from the field of criminology. Throughout the session, we explore the complexities that make illegal wildlife trade a wicked problem, including: taboo trade-offs between conservation, social and moral objectives, market uncertainties, complex feedbacks between suppliers, consumers and wildlife populations, and the financial sustainability of management plans. This is Part II of a series of symposia on wildlife crime. Part I focuses on the spatio-temporal aspects of flora and fauna poaching, Part II focuses on illegal trade, trafficking and incentives to consume and supply illegal wildlife products.



ACHIEVING CONSERVATION AND DEVELOPMENT A POLICY FRAMEWORK AND CASE STUDIES FROM THE TROPICS

Alejandro Ortega-Argueta, ECOSUR; Angelica Hernandez Guerrero, ECOSUR; Rubi Alderete-Dominguez; Danielle Barriga-Guijarro; Jose Morales-Rodriguez, ECOSUR; Mariana Pineda-Vazquez, ECOSUR

Focus in conservation has been allocated mainly to sites of high biodiversity in pristine ecosystems. However, conservationists have lately recognized that productive landscapes also contain high biodiversity, cover a greater land extension and are the territories that better meet people's demands. Considering the global trends of population growth and climate change (CC) scenarios, productive landscapes are paramount to secure current and future people's livelihoods, the ecosystems services they provide and the adaptation possibilities to cope with CC. However, in the conservation arena, such contexts have not received the attention that it deserves. This happens because productive landscapes –with interactions between people and nature - involve a greater complexity that only natural sciences cannot appraise adequately. A multidisciplinary approach of social and natural sciences is necessary to fully understand the phenomena, structure and processes imbedded in the socioecological systems. Here, humans, as resource users and decision-makers, become an essential element for whom more understanding is necessary to enhance resource management and conservation practice. In this session we will examine a series of case studies that are framed by the policy sciences, systems thinking and social and natural resource management disciplines, to generate innovative research and practice approaches to biodiversity conservation. The objectives of the session are: 1) examine the theoretical and methodological approaches to understand socioecological systems in a context of conservation and development initiatives; 2) illustrate the approaches through its application to real case studies that cover wildlife use enterprises, recovery of threatened species, protected areas governance and ecosystem-based adaptation to CC; and 3) share knowledge and learning from research and from a comparative analysis of the case studies, and facilitate discussion with attendees.

ASSESSING THE DISTRIBUTION AND THREATS OF PANGOLIN IN THE LOBEKE NATIONAL PARK OF CAMEROON

Ngu Tamufor

Pangolins are amongst the most valuable and widely traded taxa in the southeast Asian wildlife illegal trade, yet little is known of their ecology and they are rarely reported in biological surveys (Newton et al 2008). The African pangolin species ground pangolin, African white black bellied pangolin, African black bellied pangolin and giant pangolin are threatened by consumptive use in west, central and south Africa. (Kingdom,1971; Soewu and Ayodele 2009; Soewu and Adekanola, 2011). These animals are hunted for their meat and for their scales which are used for cultural and ethnomedicinal purposes including traditional African medicines, "muti or juju" (Brautigam et al; 1994; Sodeinde and Adepdipe 1995; Soewu and Ayodele, 2009; Soewu and Adekanola, 2011). The greatest threat to conservation of pangolin is illegal hunting for trade largely to supply demands in china for meat and scales used for tonics and traditional medicines (Wu et al, 2004; Liou, 2006). pangolins are exceptionally vulnerable to over exploitation as they are easily hunted, have a very low reproduction rate and do not easily breed in captivity (Lim and Ng, 2007; Wu et al, 2004). commercial harvest and trade are strongly suspected to be unsustainable and already over the past couple of decade, pangolins have become scarce in much of their former range (Yang et al, 2007). While detail data is still being conducted on pangolin species, action is needed now to save them from extinction.

ASSESSING THE SUITABILITY OF SPECIES MONITORING DATA FOR TREND ANALYSES

Elisa Bayraktarov, The University of Queensland; Megan Barnes, University of Hawaii at Manoa; Joris Driessen,

Birdlife Australia; Glenn Ehmke, Birdlife Australia; Stephen Garnett, Charles Darwin University; Sarah Legge, The University of Queensland; David Lindenmayer, The Australian National University; Louise McRae, The Zoological Society of London; James O'Connor, Birdlife Australia; Hugh Possingham, The University of Queensland; Ayesha Tulloch, University of Queensland; John Woinarski, Charles Darwin University

Understanding whether, and where, species are declining is crucial for monitoring progress towards global biodiversity conservation targets, justifying management resourcing, and stimulating a targeted response to environmental problems. However, any two monitoring programs collecting data to inform such trends for a given species are likely to differ in the data collectors, populations and locations being monitored, and monitoring protocols (e.g. timing, frequency, spatial coverage, equipment). This makes it challenging to collate and use existing monitoring data to inform indicators of national or global trends in biodiversity change. We use an Australian case study aiming at creating the first national threatened species index to illustrate the challenges when dealing with species population data gathered from multiple sources. First, we develop a set of suitability criteria for including available long-term monitoring data sets in national trend analyses, which include the level of standardization of monitoring methods/effort, consistent turnover of monitored sites, frequency and timing of monitoring, and spatial accuracy of recorded species locations. Second, we apply vetted data to derive a national threatened species index for Australian cockatoos, and illustrate how to weight the composite index using the spatial or temporal representativeness of monitoring for each species. Finally, we outline discrepancies between indices calculated with standardized vs. non-standardized data and demonstrate how using unsuitable data for trend analyses may lead to the wrong conclusions for species population change. Our approach is critical for accurate trend detection and improved indicators of national- and global- scale species declines.

BIODIVERSITY AND COFFEE

Melissa Vogt, UNSW

The impact of coffee farming on biodiversity is recognised as disproportional to area of land used for farming. Challenges in coffee farming landscapes include insufficient economic income, pest and disease outbreaks and environmental degradation. While prioritised as a cash crop and intensively farmed, a coffee farm and farming landscape seems to incapable of achieving sufficient biodiversity and conservation outcomes. Coffee farming is a cash crop activity and a lifestyle, one that some hold on to despite inability to financially benefit. Within this complex context a conceptual approach and framework was developed. The ecological sensitivity conceptual approach seeks to centralise ecological integrity through these landscapes within human, industry and commercial realities. Such an approach is considered capable of improving biodiversity and conservation outcomes and to provide economic stability. This workshop will introduce and encourage interaction with the conceptual framework for analysing coffee farming landscapes. The workshop will engage the attendees to discuss and critique the concept and framework.

BUILDING A NETWORK OF CONSERVATION SCIENTISTS ENGAGED IN ENVIRONMENTAL AND SOCIAL ACTIVISM

Cynthia Malone, University of Toronto, PhD student

As a mission-driven discipline in a world increasingly grappling with social inequality and environmental degradation, conservation blurs the line between science, advocacy, and activism. The rise of social media and advanced technological platforms for science communication has increased advocacy, allowing conservation scientists to engage with broader, more diverse audiences about their research and its connection to livelihoods. However, conservation scientists have not engaged with environmental and, especially, social activism to the same degree. This can partially be explained by a widely held belief that science is and should be apolitical. However, as political tensions rise globally, affecting scientific institutions and their funding, the question of whether and how much conservation scientists should engage with activism has become more urgent. For conservation scientists and practitioners who are people of color, women, LGBTQI, differently abled, and/or economically disenfranchised, these tensions manifest as infringements on our rights and safety. Scientists from these underrepresented groups have long argued that science is indeed political, in process and application, and an active engagement with the oppression affecting our lives, communities, and the environment is critical to ethical and effective science. This knowledge café will provide an opportunity for a deep dialogue on the challenges and opportunities for conservation scientists to engage with environmental and social activism. We will draw from regional issues in Latin America, including the steady rise in violence against environmental activists, as well as in North America, including environmental racism and an incoming U.S. administration that denies climate change. Ultimately, we will consider how we might create and advance a network of scientists invested in activism and strengthening partnerships with organizers

who translate activism into sustained and transformative change.

CASE STUDIES IN CONSERVATION: OPPORTUNITIES FOR LEARNING

Iara Lacher, Smithsonian Institution; Martha Groom, University of Washington; Tuyeni Mwampamba, Universidad Nacional Autonoma de Mexico

How can case studies be leveraged to improve conservation outcomes and education? Conservation practice is so complex that learning from our efforts often requires more detailed and nuanced presentation, evaluation and synthesis. Case studies may allow more exploratory investigation of conservation methods and practice, and thus can be powerful tools in education, policy and management. In this Knowledge Café, we wish to discuss and exchange opportunities for SCB members to use cases in their teaching or management practice, and to develop and publish case studies for more broad opportunities to learn from conservation efforts around the globe.

COMPLEMENTARY CONSERVATION STRATEGIES IN COLOMBIA: WHY THEY SHOULD BE FORMALLY RECOGNISED

Angela Santamaria, Resnatur

Colombia has made considerable efforts to accomplish the Aichi target 11 (13.71% land, 8.49% oceans), by strengthening current protected areas and establishing new ones in ecosystems poorly represented in the national protected area system. Nevertheless, it is well known that countries will hardly achieve Aichi target 11 by 2020, if they do not consider Other Effective Areabased Conservation Measures- OECM. In Colombia, several efforts have been made to increase visibility and recognize different conservation strategies, some of them known as Complementary Conservation Strategies. These measures include different governance arrangements and can range from private lands to community managed territories. This knowledge café wants to discuss and analyse how these measures contribute to biodiversity conservation and promote different governance strategies, in particular those related with conservation on private lands. These efforts need to be evaluated in the current peace scenario in Colombia. We will address the following issues: (1) Discuss which Complementary Conservation Strategies are or should be considered as OECM, (2) Define the role and importance of OECM on private lands and its recognition at national level.

CONSERVATION BIOLOGY DELIVERING SOCIAL BENEFITS THROUGH PRACTICE

Clara Solano, Fundacion Natura

This knowledge cafe aims to validate the use of sociological tools as a means to meet conservation biology objectives, while delivering social benefits. It presents experiences in Colombia that address the problems and conflicts related to the conservation of biodiversity and its services through a socioecological approach. This approach demands a deep understanding of the territory and, in particular, the acknowledgement of the relation between people, other living beings and the biophysical environment. It is expected that the benefits of integrating ecosystem preservation, biodiversity conservation, ecosystem services' provision, and human wellbeing are made evident through the exposition of case studies derived from practice. The cases presented are developed in different regions of Colombia, with diverse natural and social conditions. These cases contributed to conservation, management of biodiversity, recognition of natural capital and inception of sustainable production schemes. The tools applied and that will be portrayed include: strengthening associative processes, inducing innovative institutional arrangements, stimulating adjustments and additions to legal instruments, supporting an array of conservation strategies, contributing to land use planning, implementing sustainable production practices, and managing knowledge to facilitate decision-making.

CONSERVATION IN TROUBLED TIMES: A CALL TO USA GOVERNEMENT CONSERVATION COMMUNITY

Marit Wilkerson, USAID

The Question: In troubling political times, how can US government staff continue to enable conservation across multiple governmental levels? This cafe is for US government staff, the researchers, policy advisors, managers, etc., from the county and city levels to the federal. More than ever, government conservationists need to come together to build robust networks and strategies that can ensure the effectiveness and growth of conservation efforts. Come together to brainstorm action-oriented solutions and let us strengthen this sub-community within SCB as well!

CONSERVATION OF BIODIVERSITY IN THE HUMAN-MODIFIED DRY DECIDUOUS FORESTS OF EASTERN GHATS IN INDIA

Suresh Jones, LORIS-The Biodiversity Conservation Society

Modified and degraded lands are important for biodiversity conservation as much as for their role in supporting livelihoods of some of the poorest communities in developing countries. In India, a large portion of wildlife exists outside Protected Areas sharing the resources with people. The tropical dry deciduous forests of the 'Eastern Ghats' of India support many indigenous communities and rich biological diversity but human land-use practices have heavily degraded and fragmented this landscape in recent times. Maintaining species populations and ecological processes in the face of change is possible only when human livelihood and poverty concerns become part of the conservation strategy. It is imperative to build participatory and multidisciplinary approaches involving all stakeholders and manage the landscape both for people and wildlife. The low intensity mosaic usage of the landscape by the indigenous communities has sustained them over millennia despite vagaries in climate. Co-management and consultations with these communities can be initiated to evolve responsible local level strategies to address issues of global concern. Traditionally, conservation has been part of the culture of these village communities and opportunities need to be created for their active participation in the management of natural resources of which they would be the future custodians. It would be useful to map biodiversity rich areas within various land use categories and prioritize interventions where sustainable livelihood benefits are generated through conservation actions. In this semi-arid fragmented landscape, addressing multiple patches supporting many species of conservation significance is critical for future success of biodiversity conservation and the livelihood security of the local communities.

CONSERVATION PLAN OF THE LOWLAND TAPIR (TAPIRUS TERRESTRIS) IN THE COLOMBIAN ORINOCO

Angela Alviz, Fundación Orinoquia Biodiversa; Maira Villanueva, Fundación Orinoquia Biodiversa; Karen Pérez-Albarracín, Fundación Orinoquia Biodiversa

The lowland tapir (*Tapirus terrestris*) has the most widely geographic range within all the extant tapir species, found in 11 countries and 21 different biomes across South America (Racero-Cararrubia & Arias-Alzate, 2015). Among these habitats, they are found in tropical forests of warm and humid climates associated with water bodies and wetlands such as gallery and vega forests that are important elements of the Orinoco region (Wallace et al., 2012). Spite of the existing information, in the Colombian Orinoco the studies related to the lowland tapir are fragmented and much of the records lack of scientific support. In addition, populations have been declining by an estimated of 33% in the last three generations as a result of habitat loss, forest fragmentation, and poaching (Cruz et al., 2014), being classified by the IUCN as Vulnerable (VU). For these reasons, we aimed to describe the occupation of the species in Arauca, Casanare and Vichada in order to generate an action plan for its conservation. A general occupation model was used, the relative species abundance was estimated, and a social work was carried out with the local communities. From the scientific and social information, the Conservation Plan for the lowland tapir was generated for the departments of Arauca, Casanare and Vichada, which consists of five Lines of Action: 1. Identification and habitat conservation; 2. Scientific research; 3. Monitoring and tracking; 4. Environmental education and 5. Dissemination and institutional articulation. These lines of actions are related to the National Program for the Conservation of the Genus Tapirus in Colombia carried out by the Ministry of Environment, Housing and Territorial Development.

CREATING CONNECTIONS AMONG SCB CHAPTERS: A DIALOGUE ON WHAT WORKS IN LOCAL CHAPTERS

Andrew Gregory, Bowling Green State University; Rebecca McCafrey, USGS

Local SCB chapters provide an important grassroots role in the global society, and the number and global diversity of SCB chapters is expanding. Local chapters take many different forms as they work to engage in local conservation action, education programs, and policy efforts. The ICCB provides a rare opportunity for local chapter leaders from around the world to meet, interact, and learn from one another. In this Knowledge Café, we seek to bring together leaders and members of SCB chapters from around the world to engage in a guided conversation on the maintenance and functioning of local chapters. We will recruit members from established and highly successful chapters to share expertise and insight on long-term successes of local chapters, and invite members and leaders from newer chapters to inject new ideas and ask questions about how to sustain chapter membership and enthusiasm. Using a think, pair, share pedagogical approach, after a brief guided group discussion, participants will break into smaller focal groups to learn from each other and share ideas based on pre-determined topics of interest to our community of local chapters. Following the breakout session, focal groups will share with the larger group what their focal group discussed. These shared discussions will form the basis of the final group guided discussion. The ultimate goal of the café is to forge new connections and establish partnerships

among our global network of local SCB chapters in order to better achieve grassroots conservation goals.

CULTURAL CONSERVATION

Martin Nganje, Researcher; Taku Awa II, CAMCAER; Eric Nana

The goal of this knowledge café is to share research results including on how to streamline traditional ecological technology in operational conservation plans. Research around Kakum, Ankassa and Bia conservation areas in Ghana between 2009 and 2011 revealed that cultural conservation technology was highly significant in biodiversity conservation. The conservation experience of communities was observed to be exhibited through their development of institutions to perpetuate the use of biological resources. These regulatory processes are herewith referred as traditional ecological technology and translate as restrictions in using revered species, through; culture-based plant & animal use interdictions, culture-based plant or animal festivals, and culture-based wildlife memorials. The non-inclusion of such expertise in biodiversity conservation plans was observed to be due to limited knowledge and skills of conservation personnel in handling the ecological expertise of communities. This café will demonstrate how conservation personnel can enhance their skills in handling and integrating cultural conservation expertise in the operational plans of biodiversity conservation areas. The café is expected to attract field conservation personnel, researchers, students and conservation policy support officials. Debate questions include: (a) how can destructive culture be differentiated from constructive biodiversity conservation culture? (b) How can criteria be developed for constructive conservation culture? (c) How do we organize to streamline the criteria of constructive conservation culture in conventional biodiversity conservation plans? It will consist of 3 parts, each dedicated to one of the 3 preceding questions to be coordinated by an expert conservation planner and promoter with longstanding experience, and supported by 3 senior conservation researchers. The café will employ "task analysis" to inform on how to enhance capacity

CURRENT STATE, NEEDS AND CHALLENGES FOR BIODIVERSITY CONSERVATION IN LATIN AMERICA

Jesus Pacheco, Instituto de Ecología, UNAM, Mexico; José González-Maya, ProCAT Colombia/Sierra to Sea Costa Rica; Gerardo Ceballos, Instituto de Ecologia, UNAM, Mexico; Andres Garcia, Instituto de Biologia, UNAM, Mexico; Lourdes Martinez-Estovez, University of California Santa Cruz, USA; Horacio Zeballos, Pontificia Universidad Católica del Perú, Lima, Perú

Latin America is one of the most biodiverse regions on the planet; it sustains around 40% of all living species and almost half of the tropical forests. Within the region, there are six of the most biodiverse countries and an unparalleled ethnic and cultural wealth. These attributes confer a wide variety of ecosystem goods and services that contribute greatly to the maintenance of national economies. Nevertheless, it also faces conservation challenges due to poor management practices and the lack of enforcement to protect the resources. Deforestation, wildlife overexploitation, land-use change and pollution are the major threats. In this sense, there is a crucial need to train students, scientists and practitioners to gain the knowledge and skills they need to solve the current environmental conflicts. This talk presents a strategic initiative led by the Latin American Consortium of Conservation Biology, the Institute of Ecology at National Autonomous University of Mexico, the Scientific Collection of the Natural History Museum at the National University of San Agustín de Arequipa, Peru (UNSA), and ProCAT Colombia and Sierra to Sea Institute Foundations in Colombia and Costa Rica. This initiative, the Latin-American course on Conservation Biology, has been the platform to train more than 200 students and practitioners in seven natural protected areas of Peru, Colombia, and Costa Rica since 2011. It has also increased the current vertebrate knowledge in these areas and gave recommendations that ensure their conservation. Make this initiative available to other Latin American countries and to establish collaboration agreements for future conservation projects, are our next goals. The International Congress for Conservation Biology is the best forum to establish these connections.

DECLARING IMPORTANT SITES FOR BAT CONSERVATION IN COLOMBIA

Sergio Estrada Villegas, Marquette University; Elisabeth Bahamon Azuero, Programa para la Conservación de los Murciélagos de Colombia; Diana Cardona, Programa para la Conservación de los Murciélagos de Colombia; L. Santiago Castillo, Programa para la Conservación de los Murciélagos de Colombia; Daniel Mauricio Díaz Rueda, Universidad Nacional de Colombia - Sede Medellín; Jairo Perez-Torres, Universidad Javeriana; Veronica Plata Corredor, Programa para la Conservación de los Murciélagos de Colombia; Manuel Rodríguez Rocha, Programa para la Conservación de los Murciélagos de Colombi

Caves are remarkable ecosystems because they harbor unique biotic communities. However, caves are highly

threatened, and usually lack protection from local authorities or governmental agencies. The largest cave system in Colombia, located in the dry forest of the Chicamocha region (department of Santander), houses a rich but vulnerable bat community, but few concrete actions to their conservations have been made. Bats are crucial because they support key ecological processes in the dry forest (also a threatened ecosystem), but they are at risk due to intrusive tourism, forest deterioration and unfounded misconceptions. We sought to protect a subset of caves after evaluating 13 potential sites across the region, assessing their socioeconomic importance, and after rising environmental awareness about caves and bats with local communities and tourist providers. Our analysis allowed us to declare the Macaregua cave and La Alsacia cave as the first Important Sites for Bat Conservation in Colombia (SICOM in Spanish). The declaration was endorsed by local communities, supported by the Latin-American Network of Bat Conservation Programs (RELCOM), and ratified by the regional environmental authority. The creation of SICOMs has proved to be an effective strategy for bat conservation in Latin America, and we will soon determine whether the protection of Macaregua and La Alsacia has proved to be an effective conservation strategy. Overall, we want to integrate the SICOM strategy with mechanisms of cave management at the local level, and biodiversity protection at the regional level.

DEVELOPING A MODERN RESEARCH AGENDA FOR URBAN CONSERVATION

Travis Gallo, Urban Wildlife Institute, Lincoln Park Zoo; Lauren Bailey, Society for Conservation Biology; Megan Draheim, Virginia Tech Center for Leadership in Global Sustainability; László Kövér, University of Debrecen; Jayshree Vencatesan, Care Earth Trust; Marit Wilkerson, USAID

The core motivations for conservation science have been changing with the increase of global urbanization. For the first time in human history, the proportion of the world's population living in cities exceeds the proportion living in rural areas. Conservation scientists are now working to preserve species, habitats, and cultures in a system that is unequivocally dominated by humans. Hence, the science and practice of urban conservation is not limited to conserving species and habitats, but also encompasses socio-economic issues, human values, and environmental aesthetics. This unique set of circumstances is changing how, why, for what, and for who we do conservation science. The Urban Ecology Working Group is proposing a Knowledge Café that will compliment two symposiums, "Conserving Biological Diversity in an Urbanizing World: How is urbanization changing the science and practice of conservation?" and "Conservation science and application in urban systems." From these symposiums, we intend to publish a special issue in Conservation Biology or a similar journal, outlining a new research agenda that will address these novel challenges facing conservation science in our urbanized world. This Knowledge Café will initiate collaborate among our symposium speakers, continue the conversations started in our symposiums, and be a spring board for post-conference development of an urban conservation research agenda that will inform future research, policy, and planning in urban environments.

DO DIVERSITY, EQUITY, AND INCLUSION MATTER IN CONSERVATION? PERSONAL PERSPECTIVES FROM THE FIELD

Rae Wynn-Grant, Center for Biodiversity and Conservation, American Museum of Natural History; Martha Groom, University of Washington; Cynthia Malone, University of Toronto, PhD student; Ricardo Rocha, University of Lisbon; Eleanor Sterling, Center for Biodiversity and Conservation, American Museum of Natural History

The Knowledge Café will be an informal, participatory discussion on participants' personal perspectives on how diversity, equity and inclusion are integrated and addressed in conservation actions and research. Questions addressed during the session will include: What does diversity/equity/inclusion mean to me? How can society be more inclusive? Did my training prepare me implement diversity in conservation work? Before and during the Congress, the ICCB 2017 Conservation Committee will encourage attendees to tweet using the hashtag #Equity_ICCB2017. The tweets will be collated to get a broader understanding of the issues that arise and are important to the participants. The Café will allow the participants the opportunity to reflect on and learn from their experiences during this session.

EDGE EFFECTS ON FAUNA FLORA AND PROCESSES IN THE BRAZILIAN CERRADO

Pavel Dodonov, State University of Santa Cruz; Fernando Andriolli, National Institute of Amazon Research; Andreza Braga, Independent; Karen Harper, Dalhousie University; Felipe Martello, São Paulo State University; Ingrid Paneczko, Independent; Milton Ribeiro, São Paulo State University; Dalva Silva-Matos, Federal University of São Carlos; Thamyrys Souza, State University of Santa Cruz; Marina Telles, Federal Institute of São Paulo

Edge influence is one of drivers of ecosystem degradation caused by habitat fragmentation, but our knowledge of edge influence in non-forest vegetation is limited.

We performed a series of studies on how edges affect plants and animals in the Brazilian cerrado, a floristic domain with forest, savanna and grassland ecosystems. We studied edge influence on microclimate, vegetation structure, plant litter, invasive and native graminoids, nest predation and dung beetles in a total of 23 fragments, with 1 to 15 fragments per study. Most of the variables studied were affected by edges in at least some fragments, usually up to 5-30 m from the edge. Edges tended to be hotter and drier than adjacent interior forest and have fewer fine twigs on the ground layer. In forest vegetation, canopy trees tended to be taller close to the edge. A conspicuous pattern, also observed in previous studies, was the increased abundance of the African grass *Urochloa decumbens* close to the edge, sometimes accompanied by a decrease in native grasses. The African grass *Melinis minutiflora* was not affected by edges. Dung beetle richness was not affected by edges, but their abundance was, with positive edge influence on paracoprids (tunnelers) and negative edge influence on telecoprids (rollers) at cerrado-pasture edges. Nest survival was greater in the interior for nests placed at 0.6 – 1.8 m above ground and predation by birds was higher at the edge for nests placed at 1.9 – 3.2 m. Although the effects for some groups, e.g. dung beetles, varied between land uses, edge influence was generally not restricted to high-contrast edges. Thus, narrow firebreak edges affected variables such as microclimate, *U. decumbens* abundance, vegetation height and nest predation. Our results show that edge influence is an important factor in affecting plants and animals in fragmented cerrado landscapes, and its mechanisms should be better understood in to improve management strategies.

EPIPHYTIC COMMUNITIES IN THE VERTICAL PROFILE OF AEXTOXICON PUNCTATUM IN MOCHA ISLAND CHILE

Daniela Mellado, Universidad Austral de Chile; Iván Díaz, Universidad Austral de Chile; Ricardo Moreno, Universität Göttingen; Gabriel Ortega, Universidad Austral de Chile

The Mocha Island holds the last relict of coastal old-growth temperate rainforest in south-central Chile. The hills and some of the valleys of the Mocha Island were declared National Reserve in 1988 to protect the endangered populations of the Pink-footed Shearwater (*Ardenna creatopus*) and to ensure water provision to the local population. The dominant forest cover is known as "olivillo coastal forest" because of the abundance olivillo trees (*Aextoxicon punctatum*), a primitive angiosperm endemic of Chile. Most of the old-growth olivillo coastal forest has in mainland has been cleared for agriculture and industrial forestry expansion. Therefore, to describe species richness and diversity of these forests is a priority for conservation, especially in its least explored habitat: the forest canopy. Our goal was to document the vegetation which inhabits the canopy of this relict forest. This is among the first studies in forest canopy in Chilean forests and is the only exploration of the canopy biodiversity in the Mocha island. We climbed 10 olivillo trees distributed in five plots of vegetation along an altitudinal profile in the island. In each tree we registered all the vascular species and also the abundance of non-vascular groups as bryophytes and lichens. We found 15 vascular plants (ferns and vines), the richest family was Hymenophyllaceae (5 species). Also, we found associations between vascular species and non-vascular groups to trees structure as crowns and trunks. The forest of the Mocha Island is the last undisturbed old-growth forest at north of the 40°S. Therefore, the information provided here contribute to improve the baseline of the canopy biodiversity in olivillo coastal forests, for management and restoration plans in similar forest areas in the mainland.

GFW BIODIVERSITY

Carolyn Ciciarelli, World Resources Institute

Over half the world's terrestrial plant and animal species reside exclusively in forests. Numerous studies also document how unevenly such forest biodiversity is distributed. At a local scale, a eucalyptus plantation or a logged natural forest stand support significantly fewer species than would a tract of intact primary forest. Currently the GFW platform offers excellent, timely data on the location of forests and forest change, but until recently it lacked a systematic approach for indicating the global or local value of forest tracts to biodiversity conservation or the relative biological impact where forest change occurs. This critical gap in information is being addressed by the emergence of Global Forest Watch Biodiversity, an initiative supported by leading conservation specialists. In this discussion, we will present two critically important Use Cases that links vital biodiversity data to forest change data on a weekly and annual basis via the GFW platform. The first is a filtering of forest change alerts (currently available on the GFW platform) by different biodiversity variables. This will allow a user to display those forest alerts of most importance to them - whether it be alerts found in all Tiger range states combined or a particular AZE site in Peru. This will add clarity and identify the urgency of the millions of disturbance alerts surface on the GFW platform each week. The second is a seamless and global layer of biodiversity value of forest cover, and changes, using a novel combination of biodiversity data that can be used to inform various policy processes. Users will then be able to identify the highest priority areas

for conservation action and understand the biodiversity impacts of forest loss. These new data and insights can be accessed through a user-friendly interface, providing researchers, conservationists, governments, journalists and more with critical and timely data in a simple to understand format.

HONORING PASTORALISTS

Brett Bruyere, Colorado State University

In a 2015-16 study with pastoralists in northern Kenya, the results about their beliefs, perceptions and attitudes toward grazing management, wildlife conservation and the viability of their livelihood for the future yielded mixed results. Some felt marginalized, angry or starkly unsure about conservation efforts, while others saw positive opportunities for co-existence with wildlife and new livelihood opportunities. Conversely, a comparison group of peers from the same tribe and community expressed very little interest in a traditional pastoralism livelihood, and rated wildlife conservation as a top priority. With a global agenda to improve educational access for young people in the developing world, and a shift in northern Kenya toward more formally-governed rangelands that place new restrictions on pastoralists' movement, what will happen to pastoral livelihoods? While fewer pastoralists might be good for a rangeland when considered strictly from an ecological standpoint, what is the ethical obligation to give equivalent commitment to insure that individuals who feel adversely affected by conservation and education are provided livelihood alternatives that are acceptable and agreeable? This knowledge cafe is open to anyone working with pastoralists in regions or communities where pastoralists are at risk of being "left behind" by contemporary conservation as well as community development more generally (e.g., enhanced access to schools, improved infrastructure, new economies).

HOW CAN VAST BIODIVERSITY DATASETS EMPOWER (RATHER THAN OVERWHELM) TROPICAL PARK MANAGERS?

Michelle Duong, Yale University; Diego Ellis Soto, Yale University; Walter Jetz, Yale University; Nigel Pitman, The Field Museum; Diana Alvira, The Field Museum; Nora Bynum, Field Museum; Corine Vriesendorp, The Field Museum

This knowledge café explores emerging opportunities for collaboration between the biodiversity informatics experts who manage large biodiversity databases and the conservationists who manage that biodiversity in South America's parks and reserves. We seek a series of open, creative conversations around the question "What key information about biodiversity do park managers need on a regular basis, and what are the most effective ways to deliver that information?" While we expect these discussions will interest a broad range of tropical biologists and conservationists, we expect most participants to be land managers and informatics specialists. At the beginning of the café a guest speaker will provide a quick overview of existing biodiversity tools and indicators, with specific examples from Andean countries. Next, each of the three small groups will explore the question at a different spatial scale: 1) for individual parks, 2) for regional park networks (e.g., all parks in the same watershed), and 3) for country-wide park networks. The short-term outcomes we expect from these brainstorming sessions are critiques of existing tools that report on biodiversity trends in parks, ideas for new tools, and stronger working relationships among informatics specialists and conservationists in South America. Because the authors are actively developing new biodiversity tools for South American parks, we envision concrete longer-term outcomes in the form of improved prototypes of 'biodiversity dashboards' that support conservation decision-making by providing quick overviews of the biodiversity in parks and park networks.

HOW CAN WE BRIDGE THE GAP BETWEEN LARGE-SCALE CONSERVATION VISION AND LOCALLY-APPLIED ACTION

Tom Akre, Smithsonian Conservation Biology Institute; Iara Lacher, Smithsonian Conservation Biology Institute

As we enter the Anthropocene, the negative effects of humanity on natural resources and biodiversity are undeniable. Land use change has consequences at the regional and now, even global scale. Drivers of change that result from interactions between the environment, social and economic demands, policy changes, and scientific advancement contribute to biodiversity loss and the diminution of ecosystem function. Understanding how these diverse drivers shape our landscape requires interdisciplinary research approaches that consider current, local impacts as well as broader geographic and temporal influences. Using long-term, landscape-scale planning to guide the prioritization of site-specific conservation action is becoming even more necessary in this era of rapid change. We must consider appropriate scales for conducting scientific research, monitoring change, incorporating regional needs and desires, and influencing policy. Fortunately, broader-scale analyses are now possible due to advances in technology and computing power. Even so, we are still challenged with forging concrete connections between large-scale vision and locally-applied

conservation action. Thus, the question arises, how do we bridge the gap from information to real-world application? This knowledge café will be a place where people of diverse backgrounds, education, and scientific fields can openly and creatively discuss the challenge of conservation research and action at multiple scales and dimensions. Through a series of related questions on science, data, and governance, we hope to broaden our individual and collective perspectives and foster collaboration among our peers. Through this discussion, we may discover alternative pathways for research and identify new options for delivering information and data for use by conservation managers, planners, or policy makers.

HOW CAN WE FOSTER COLLABORATION BETWEEN ENERGY TECHNOLOGISTS AND CONSERVATION BIOLOGISTS?

Steven DeCaluwe, Colorado School of Mines

For a majority of both conservation biologists and clean energy scientists/engineers, our efforts are animated by a common central pursuit: to mitigate and curb the deleterious effects of human activity on Earth's biosphere. Yet despite this common bond, communication and collaboration between the two fields is rare, driven in part by highly divergent content knowledge and day-to-day activities, and in part by a lack of incentives in research and professional environments that tend to struggle with how to properly credit highly interdisciplinary work. Regardless, the potential benefits to both fields from improved communication and collaboration are difficult to deny. For those involved in basic science and engineering of energy devices, collaboration can lead to a understanding of how the manufacture, use, and disposal of such devices impact the natural environment and how human users of devices interact with said environment. For conservation biologists, an enhanced understanding of current and emerging energy technologies can better inform policy advocacy efforts, help conservationists better anticipate future conservation challenges due to changing natural resource use patterns, and leverage emerging technologies to beneficially alter human-environment interactions, particularly in fragile and biologically diverse ecosystems. This knowledge café is posited as a first step in building the required bridges between those in the conservation and energy technology fields. Rich conversations will center on topics such as: (i) What are the areas/subfields in which conservation biology and energy technology efforts (research, application, and policy advocacy) can best inform and reinforce one another? (ii) How can we frame the value of such collaborations, such that they are properly incentivized by each of the respective fields? (iii) How can societies/organizations (such as SCB) support and encourage such communication and collaboration?

HOW IMPORTANT IS FLEXIBILITY IN CONSERVATION?

Gwenllian Iacona, University of Queensland; Jonathan Rhodes, The University of Queensland

Governments and conservation organisations invest billions of dollars a year in the protection of biodiversity. These investments are made in a wide range of conservation mechanisms, but investment in permanent protection (such as protected areas) is often seen as the gold standard. This targeting of permanence makes sense because it is likely to maximise the long-term persistence of species in the presence of ongoing threats. On the other hand, economic theory tells us that when uncertainty about the benefits of alternative conservation investments is high, flexible investments that do not lock-in a decision (such as short-term payments for ecosystem services) are likely to be valuable. This is because it allows conservation strategies to be modified through time as new information becomes available and is central to successful adaptive management. But, achieving both flexibility and permanence is an unrealistic goal, so there is a tension between these two objectives that manifests as a trade-off between flexibility and permanence. Ultimately, the best decision about the level of flexibility to target will depend on the trade-offs between flexibility and permanence, the level and types of threat and uncertainty, and the decision context. We will propose a framework for thinking more coherently about the role of flexibility in conservation that is explicit about the costs and benefits of flexibility and the trade-offs with permanence. By drawing on conservation examples, we will illustrate potential applications of the framework and discuss ways forward to operationalise more explicit consideration of the benefits and costs of flexibility.

HUMAN DIMENSIONS OF CONSERVATION TECHNOLOGIES

Nicole Sintov, Ohio State University; Viviane Seyranian, California State Polytechnic University - Pomona

New technologies can considerably aid conservation efforts. In particular, a number of technologies can help monitor conservation activities and address wildlife crime in protected areas. For instance, drones with infrared technology can scan protected areas for poachers, who can then be apprehended by ground patrols. As helpful as new technologies like drones can be, they cannot support conservation in isolation. Their success hinges in large part on their adoption and proper use by humans (i.e., park

managers, rangers). Although research from various fields (e.g., management, psychology) highlights that accounting for human factors can facilitate technology adoption and proper use, in conservation, literature on this topic is scant, leaving open questions such as which factors help or hinder adoption and dissemination of technologies, how end users interact with innovations, what strategies can be used to promote adoption, and how effective such strategies are. The social sciences are uniquely positioned to address these questions and advance knowledge of this human-technology interface. In this Knowledge Café, participants will explore these topics through consideration of the café's key question: how do end users influence the conservation impacts of monitoring / wildlife crime technologies? The moderator will provide a brief overview of knowledge café logistics, and then introduce the key question of the café, along with several subthemes: (1) Which human factors influence technology adoption and dissemination (motivators and barriers)? (2) How do users actually interact with technologies? (3) What are the conservation implications of these various modes of use? (4) What strategies can be used to promote technology adoption? (5) What gaps exist in the research in this area? The goal of the café is to foster the development of a community of researchers interested in this topic who may potentially collaborate and produce a journal article.

IDENTIFYING SCALING-UP EFFECTIVE INTEGRATIVE SOLUTIONS FOR JAGUAR CONSERVATION

Anthony Giordano, S.P.E.C.I.E.S.

Jaguars are often portrayed as the charismatic face of diverse conservation efforts across the Neotropical Biogeographical Region. Despite the persistent idea that the jaguar can be an effective "umbrella" for saving biodiversity across the Latin America's forests and savannas, the range of the hemisphere's largest felid continues to contract. Jaguars have already been extirpated from half of their former range in Mexico, 95% of their former range in Argentina, and are extinct in Uruguay and El Salvador. Habitat fragmentation, protected area degradation, rapid land use change, conflict-related mortality, and a declining prey base still figure among the same major threats nearly two decades after they were initially summarized at the first range wide jaguar conservation planning workshop. For some biomes in fact, including the Atlantic Forest, Gran Chaco, Cerrado, and parts of the Amazon Basin, these pressures have increased significantly. We intend to review and clarify the complex and frequently hierarchically scalar drivers of continued jaguar populations decline and disappearance. We will then discuss and propose feasible, integrative remedies to these threats at different geographical and socio-economic scales, and across different ecological and land use contexts. We will also attempt to evaluate and challenge their palpability from the perspective of different stakeholders, and discuss the role if any for technology and innovation in addressing the drivers of threats to jaguar populations at different scales. We hope to emerge with a greater understanding of how the different threats relate to each other; the integrative, interdisciplinary, multi-scalar solutions needed to address these threats, and a clearer roadmap through the challenges to implementing these solutions.

IMPROVING COMMUNICATION STRATEGIES TO CONSERVE A RISK-LADEN SPECIES FACING A CONSERVATION CRISIS

Heidi Kretser, Wildlife Conservation Sociey; Bruce Lauber, Cornell University; Katherine McComas, Cornell University

Communicating conservation messages for bats affected by white-nose syndrome (WNS) is challenging because bats are a risk-laden species; they carry rabies. Public health agencies have messages about bats with more cautionary content compared to state wildlife and conservation organizations messages. Given the precipitous decline in bat populations in North America due to WNS, we need to understand diverse agency objectives, develop communication plans that reflect nuances of these differences, and craft and test messages with appropriate audiences. We sought to understand organizational perspectives on communication strategies about bats and identify messages that can promote bat conservation and protect public health. Our goals were to 1) Determine objectives of current bat-related communication by wildlife and public health agencies and other organizations, including behaviors being encouraged or discouraged in target audiences; and 2) Identify messages that attempt to influence homeowner behavior around bats and assess compatibility of desired behaviors across multiple messages and agency objectives. We used interviews with 36 individuals representing federal, state, county, tribal and private government and non-government organizations to assess the process of developing communication messages. We confirmed differences in communication emphasis between conservation-oriented and health-oriented agencies but saw clear willingness to integrate messages as opportunities arise. Interviewees noted agency mandates and time as major barriers to integrated messaging. Public health veterinarians, agency wildlife personnel and conservation professionals agreed on important messages about bats, yet these more holistic messages became diluted where actual communication with landowners and the public occurred. This work will

guide message development to inform a holistic approach to communication about human health, white-nose syndrome and bat conservation.

INCREASING QUALITY AND DIVERSITY IN FIELD SCIENCE EDUCATION

Catherine Macdonald, Abess Center for Ecosystem Science and Policy

Field science often requires extensive specialized but non-academic knowledge (e.g., working on a boat or in a remote location, knot-tying, gear construction/deployment, sample taking, in-field species identification) that is difficult to effectively teach in a classroom setting. Presently, most students learn these crucial skills piecemeal from formal and informal mentors. However, many of these mentors are professional scientists for whom field research is only one component of their increasingly demanding academic teaching, research, and publication schedules. In this session, we will discuss and brainstorm how the scientific community can create and maintain high quality field education standards without simply increasing the current workload of research scientists. We will also discuss the importance of providing access to field experiences and training in a way that nurtures economic, gender, and racial diversity in conservation and field science. Women and minorities are significantly underrepresented in scientific careers and recent research suggests that increased funding towards encouraging these groups to pursue STEM careers has been of limited efficacy in increasing recruitment or retention in the absence of cultural changes in the scientific establishment. Participants will discuss and brainstorm solutions to problems including A) limited opportunities for low-income students to gain field experience, B) cultural heterogeneity among students, and C) in-field sexual harassment (in one survey, 64% of scientists responding had experienced sexual harassment during field work, and 22% had experienced sexual assault). Discussion will focus on actionable ways scientists can create a safe and inclusive atmosphere for all students, particularly in geographically and socially remote field sites. Implications of these challenges and potential solutions for the quality of conservation field work and research will be considered and discussed.

INTER-AGENCY COLLABORATION FOR PARTICIPATORY APPROACHES TO CONSERVATION IN THE ANDEAN AMAZON

Diana Alvira, The Field Museum; Ashwin Ravikumar, The Field Museum;

Diverse actors increasingly recognize the importance of empowering local people for conservation initiatives to succeed. The objective of this knowledge café is to engage participants in an open, creative conversation around the question "What can we learn from participatory conservation projects, and how multi-stakeholder groups and platforms are working to scale up participatory approaches to conservation in the Andes Amazon region?" We aim to convene practitioners, local community members, and environmental and social conservation scientists working with communities in the Andes Amazon region. At the beginning the facilitator will briefly introduce the café, making its purpose clear, and pose the main question. Participants will be divided into three conversation groups, and will change groups three times so they have 3 conversations each for 20 minutes. After the third round of conversations the whole group will reassemble in a circle to exchange ideas for 20 minutes. We will appoint an external note taker to keep record of the conversation, and for follow up actions. We expect to learn from each other particular experiences (failures and successes) with inter-agency collaboration for participatory approaches to conservation, and to develop stronger working relationships among practitioners and conservation scientists in the Andes Amazon region.

LIVESTOCK GRAZING: THE EMERGING THREAT IN GIANT PANDA HABITATS IMPACTS DRIVERS AND SOLUTIONS

Binbin Li, Duke; Stuart Pimm, Duke University;

Livestock grazing has become the most prevalent human disturbance in the giant panda habitats. However, little is known about their impacts on the habitat quality and habitat use for this endangered species. Wanglang National Nature Reserve is among one of the earliest panda protected areas in China but has suffered from increasing livestock grazing in the past 15 years. An estimate of nine-fold increase of livestock from the neighboring community has been observed here. We combined field survey, bamboo experiments, and GPS collar tracking data to understand the impacts of livestock grazing. Livestock especially horses grazed on bamboos, greatly reduced the biomass and bamboo regeneration. Most of current species distribution models only consider the abiotic factors without taking species interaction into account. Here we presented the results of adding livestock to the giant panda distribution model, which showed a 35% reduction of available habitats after the livestock was introduced. This could cause further fragmentation of panda habitats and change their habitat preferences in the long run. By comparing the distribution of pandas before and after livestock was introduced,

we found pandas were driven out of the areas used by livestock intensively, especially valleys. By interviewing the surrounding local community, national forest policies, hydro power construction and tourism were the major drivers for increasing livestock in this area. The small-scale livestock sector has penitential negative impacts on the tourism and locals prefer long-term cash flow to give up livestock. Thus, we recommend the government to provide another payment for ecosystem services project which uses opportunities in tourism development to solve the problem.

LOVE THY NEIGHBOUR: DEVELOPING TRUST AND PARTNERSHIP BETWEEN PARK AUTHORITIES AND LOCAL COMMUNITIES

Salamatu Fada, Bangor University; Tuyeni Mwampamba, Universidad Nacional Autonoma de Mexico; Matt Hayward, Bangor University; Audu Katagum, Bauchi State Government; Habu Mamman, Yankari Game Reserve; Andrew Pullin, Bangor University

Globally, it is not uncommon for communities residing close to protected areas to host negative attitudes and even animosity towards park authorities and the government. Partially due to the top-down nature of protected area gazetting and management, local priorities and the aspirations of nearby communities are rarely considered and they are oftentimes in direct conflict with park and reserve objectives. Disparities of visions and mismatch of expectations threaten protected areas' ability to fulfill conservation goals and fail to garner the necessary support of local communities. Park and reserves faced with unfriendly neighbours must often undergo a complete overhaul in approaches and attitudes towards local stakeholders and open the doors to their inclusion in management decisions. Using the case of Yankari Game Reserve in Nigeria, where the State Government and reserve authorities have decided to undertake such an overhaul after studies revealed distrust and negative attitudes towards them by local communities, we demonstrate the benefits and challenges of integrating participatory approaches in planning and managing protected areas. Beginning with a vision exercise, we applied a participatory tool to identify commonalities of interests and expectations among stakeholders related to the Reserve, and used these to restructure how the Reserve should operate to benefit local communities and wildlife conservation, and to carve out the active role of local communities in Reserve management. The lessons learned from the exercise in Yankari are invaluable for conservation managers worldwide who must strike a perfect balance between achieving conservation objectives, garnering local support, and enabling sustainable livelihoods for nearby communities.

LYNX CRITICAL THRESHOLDS TO ENVIRONMENTAL STRESSORS: AN ECO-PHYSIOLOGICAL APPROACH

Catarina C.Ferreira, UFZ - Helmholtz-Centre for Environmental Research, Trent University; Gabriela F. Mastromonaco, Toronto Zoo; Dennis L. Murray, Trent University; James D. Roth, University of Manitoba; Christa M. Szumski, University of Manitoba; Christine V. Terwissen, Trent University

Habitat fragmentation is a key driver of biodiversity decline and its impacts can manifest at several levels, namely on an individual's physiology. Investigating how an individual's overall health is affected by land use changes is crucial to understand how species respond to human-induced stressors. However, individual diet can also influence physiology, especially in the case of specialist consumers, for which prey scarcity can constitute an additional source of stress. Hence, including diet specialization in models investigating variation in stress hormones could provide further insights on the mechanisms driving species' responses to altered environments. Modern techniques of measuring hormonal and dietary responses from animal tissues (such as hair) is an underused approach by which we can further our understanding about this topic. This study used Canada lynx as a model to explore these research questions using stress hormones (cortisol) and stable isotope analyses. Temperature and forest cover had the highest influence on cortisol levels across lynx northern distribution range; an extended analysis determined that diet specialization and latitude were also important to explain variation in lynx cortisol levels. Hair cortisol showed a gradient pattern where colder (and increasingly northern) regions had higher values, probably because individuals need higher energy metabolism to adapt to harsher winter conditions, whereas they decreased with higher percent forest, indicating that their distribution is associated with dense regenerating forests (lower latitudes) and where alternative prey is increasingly available (consistent with current literature). To our knowledge this represents one of the first attempts to look at potential large-scale sources of stress across a species' distribution range using hair hormone analysis, and to marry chronic stress data with diet analysis in an effort to gain a physiological perspective on prey choice in felid species.

MAPPING THE ARTIFICIAL LIGHTSCAPES OF THE KRUGER NATIONAL PARK

Bernard Coetzee, Organisation for Tropical Studies & GCSRI; Kevin Gaston, University of Exeter; Izak Smit, Scientific Services, Kruger National Park

Light pollution is increasingly recognized as an important threat to species and ecosystems. The artificial light produced by human infrastructure may alter the physiology, behavior, ecology, and ultimately the abundance and distribution of organisms. Recent work has demonstrated that in Europe and North America, high proportions of protected areas exhibit increased levels of nighttime light, and a high proportion of global protected areas (32–42%), have undergone significant increases in artificial nighttime lighting in recent years. However, the extent to which artificial nighttime lighting affects protected areas at the more local scale remains unclear. Furthermore, to enable the accurate assessments of the impacts of light pollution on species, it is first necessary to map the range and magnitude of artificial light at night. Here, we demonstrate the use of a globally novel ground based technique to estimate the extent of light pollution in one of the world's most iconic National Parks. We captured the extent of artificial light incursion into the Kruger National Park, South Africa, which emanates from surrounding human infrastructure. In so doing, we quantified and mapped the lightscapes at night. Our work demonstrates that while truly dark areas persist, artificial light can be detected up to 50km inside the Park, emanating from regions outside of it. We also identify the key hotspots in the landscape that are particularly susceptible to light pollution. Ultimately, and disconcertingly, the work shows that the biodiversity in many of the protected areas globally facing similar light regimes can no longer be thought of as free from the effects of light pollution.

MAXIMIZE EFFECTIVENESS OF ENVIRONMENTAL EDUCATION THROUGH A APPLYING HUMAN ECOLOGY APPROACH

Huyen Do, Gaia Nature Conservation

Vietnam is one biodiversity hotspot of the world. However, the country is facing a many biodiversity threats. Environmental education (EE) is widely regarded as a sustainable and effective solution for conservation issues. However, in such a developing country as Vietnam, EE is not always designed and implemented appropriately and thus not necessarily an effective solution to conservation. Many EE programmes in biodiversity hotspots in Vietnam are spontaneous and not really address its conservation issues. This presentation discusses an innovative approach in maximizing effectiveness of EE and thus contributes better to nature conservation. In this approach, human ecology features of a community or target group is carefully researched and evaluated in order to develop and implement an effective EE programme that meets the need of the target groups as well as removing conservation threats. Environmental educators need to put each negative behaviour in its human ecology context to understand why the negative behaviours exist and how to promote positive behaviours. A thorough understanding of the stakeholders and their human ecology is necessary for an effective EE programme, including age, gender, ethnic, culture, custom, religion, economical condition, institution, law… why they practice negative behaviour and what are their motivations to change, what are the barriers to positive behaviours. In addition, most of EE programmes regard human as threats or causes of conservation issues. And thus, its objectives are to help human change in order to minimize negative impacts onto the nature. We need to change this approach. Human being should be regarded as a part of the human ecology; and they are potential resources of changes toward nature. The approach was successfully applied to a number of EE programmes in Vietnam ranging from national parks and protected areas to cities, targeting wildlife trade issues, biodiversity degradation, and marine resource protection.

MORTALITY EVENT OF WHITE-LIPPED PECCARY (TAYASSU PECARI) IN THE TAMBOPATA NATIONAL RESERVE PERU

Paloma Alcázar García, Centro de Ornitología y Biodiversidad; Nancy Carlos Erazo, Centro de Ornitología y Biodiversidad

The white-lipped peccary (*Tayassu pecari*) is a species of big ecological importance; its population has decreased due to illegal hunting, habitat loss, epidemics, among other causes. Mysterious disappearances have been reported, leading to long period absences such as observed in Manu National Park. The Tambopata National Reserve is a protected natural area located to the southeast of Peru, where is the Tambopata Research Center, a research and ecotouristic facility with a population of white-lipped peccaries that can be frequently observed in the trails located on terra firme and successional forest. In the early months of 2014, five individuals of *T. pecari* were found dead in the surroundings of the Center, four of them in advanced state of decomposition (carcasses), and only one in condition to perform a partial necropsy, evidencing lesions compatible with pneumonia. Following these events, a 5-week follow-up was carried out on the trails in search of dead individuals, as well as groups or herds to determine their body condition, observation of

possible clinical signs and collection of fecal samples. It was determined that the animals did not exceed a body condition of two, on a scale of one (poor condition) to 5 (obesity), which could be related to the time and scarcity of resources in the area, and non-specific signs such as decay and claudication in two individuals. Fecal samples analyzed with parasitological techniques were not of greater relevance. Five dead individuals were found, with different degrees of decomposition without the possibility of necropsy or collection of samples. The findings did not allow corroborating if it were an event of episodic or eventual massive mortality, making it evident the need to carry out more investigations to know the baseline mortality patterns through long-term monitoring programs aimed at knowing the health status of white lipped peccary.

NEXT GENERATION CITIZEN SCIENCE AMPLIFYING THE IMPACT

Nina Hadley, Adventure Scientists

Is the global conservation community missing a valuable opportunity to focus the efforts of over a million volunteers annually to more directly achieve tangible, conservation impacts? Citizen science and its engagement with the worldwide volunteer community have largely evolved as a driver of environmental education and an effective vehicle for public outreach and participation. However, data collection efforts at the scale or locations necessary to truly "tip the scales" are still frequently constrained by limited time, funding and skilled human capacity. Participants joining this Knowledge Café will explore ways the conservation community can take citizen science to the next level – towards impacting decisions within policy, land management, business practices and more.

ON AND OFF THE BEATEN TRACK: CAN EARLY-CAREER CONSERVATIONISTS GET BETTER CAREER GUIDANCE?

Stuart Paterson, Fauna & Flora International; Christina Imrich, Wildlife Conservation Society, Andrea Santy, WWF

Working in conservation can be a competitive business, not least when it comes to carving out a career. The conservation sector attracts educated, committed and passionate people who compete for university places, scholarships, project funding, and opportunities to gain hands-on experience. First roles in conservation tend to be linked to academic research, low-paid and on short-term contracts. Expectations for career advancement, job security and work-life balance change with time. The capacity building community grants opportunities to provide early-career conservationists with a step onto, or up the career ladder. Through small funding grant programmes, internships, training courses and other support mechanisms, conservation capacity builders maintain close relationships with their grantees and monitor their career progression and impact of their work. Additional support includes introductions to professional contacts and access to networks, review of proposals, on-going professional development opportunities, and provision of reference letters. But, could the donor/capacity building community do more to offer, or facilitate the delivery of career advice? During this knowledge café we shall discuss questions to help frame what level of support might be needed to give career advice and who might provide this. Question will include: what career development support is already being delivered; how can gaps be filled; why are there barriers in career development and can these be overcome; what are key enabling factors to planning and progressing along a career path and barriers to career development. The desired outcome of the meeting is to have an understanding of how to guide and retain people working in conservation and to decide mechanisms that donors, capacity builders and others can use to take this forward.

PARTICIPATORY RURAL APPRAISAL METHODS FOR CONSERVATION

Daniela Lainez Del Pozo, University College London; Jennifer McRuer, UofS and DICE; Holly Niner, UCL

Direct users of the environment hold local and traditional knowledge that is essential for sustainable management and effective conservation. Social scientists frequently gather this type of knowledge through the use of participatory rural appraisal (PRA) methods. These methods have great potential for conservation as they afford quality, rapid, and affordable data collection with the involvement of stakeholders. This latter engagement further minimizes the social impacts of conservation interventions. However, PRA methods are not common in conservation. Too often, conservationists trained in the natural sciences tend to approach social science from a positivist perspective that relies strongly on "objective" quantitative analysis and the use of surveys to gather data. The challenge with survey data is that it does not afford in-depth analyses which itself is hard to gather, time consuming, and not always readily available. PRA methods present an alternative that can complement survey methods. However, many conservationists from natural science backgrounds tend to regard this qualitative approach with mistrust, dismissing their potential. It is even more challenging for conservationists to adopt PRA methods, as clear guidance is lacking on how to apply these methods to conservation.

This knowledge cafe aims to address this absence of clear methodologies for applying participatory rural appraisal in conservation. We seek to gather experiences of best practice from different disciplines, by encouraging social and natural scientists, practitioners, managers, and interested members of the public to contribute to the assimilation of methods. The aim is to create space for collaboration to develop a guide for early career researchers and those lacking formal training in the area, to facilitate coordination and/or integration across scientific disciplines in future research.

PRIORITIZING CONSERVATION ACTIONS FOR THREATENED SPECIES IN THE TROPICS

Eliana Fierro Calderon, Asociacion Calidris; Jeisson Zamudio, Asociacion Calidris Santiago Zuluaga, Proyecto Águila Crestada; Christian Devenish, Manchester Metropolitan University

Biodiversity in the tropics is larger than in any other region in the world, but its threats are equally numerous and varied. This biodiversity is mostly found in developing countries, where the policies of economic growth are large and natural resources are exploited without control by local communities and big corporations sponsored by governments. It is of particular concern that this biodiversity includes a large amount of threatened and endemic species, which are rare and irreplaceable, whose habitats are being fragmented and deforested. In many cases, we do not have enough information about the biology and ecology of these species to make decisions for their conservation, while for other species there are national or local conservation management plans. Although these plans are a first step to the species' protection, the decisions about conservation actions are usually taken without a real understanding of the species status on the field. This is especially important for species at critical status with more than 50% of extinction probability during the next 10 years. Some developing countries like Colombia, are facing additional challenges. The peace agreement signed between the government and the FARC rebels in 2016, has increased international community's interest in the country, and areas that were considered dangerous are available now to visit. This is a great potential for markets like the tourism and mining, but also for research and conservation. This scenario arises several questions: What information is necessary to design effective conservation management plans? How can we prioritize conservation actions for species with little information or for threatened species in critical and endangered condition? This knowledge cafe wants to open the discussion about the prioritization of conservation actions for threatened species in the tropics that require urgent attention.

PROTECTING TRANSBOUNDARY WATERSHEDS: THE CASE OF THE OKAVANGO BASIN

Adjany Costa, National Geographic

The Okavango Delta, located in northern Botswana, is one of Africa's most important sites for biodiversity, home to the world's largest remaining elephant population, as well as lions, cheetahs and wild dog. It is also the largest freshwater wetland in southern Africa, sustained by annual cycle of flooding. But its future is uncertain as it is linked to the health of the rivers that feed it, rivers which originate in Angola, then converge and flow through Namibia into Botswana. The Delta itself is a UNESCO World Heritage site, but north of the Delta the river catchments in Angola--upon which the entire system depends--are unprotected and vulnerable to development pressures. Recent expeditions by the National Geographic Okavango Wilderness Project have revealed a system of near pristine source lakes in the Angolan highlands which have remained largely unexplored. These lakes are surrounded by vast tracts of miombo woodland and peat deposits which serve important functions, regulating the ebb and flow of 95% of the water that feeds the Delta. They also harbor important populations of carnivores and species only now known to science. However, this system is also under threat from increased degradation and erosion as uncontrolled fire creeps closer to river banks. In addition, with water demands mounting, any proposed water abstraction or irrigation scheme in each of the three countries sharing the basin will have a major impact on the overall system, the health of the Delta and the communities that depend on this water source. Protecting the greater Okavango basin therefore presents a complex challenge as we must address the source as well as the waterways that travel over 1,900 km through different land uses zones and administrations. This knowledge café will explore the question of how do we protect transboundary water systems.

SAFEGUARDING SPACE FOR NATURE SECURING OUR FUTURE DEVELOPING A POST-2020 STRATEGY FOR THE CBD

Noelle Kumpel, Zoological Society of London

With the signing of the Sustainable Development Goals and Paris Agreement, governments have committed to halt biodiversity loss, develop sustainably and address climate change. The next few years will be critical for developing a new post-2020 global strategy under the Convention on Biological Diversity (CBD) to help achieve

these goals. While a number of the CBD's current Aichi Biodiversity Targets focus on safeguarding, sustainably using and restoring space for nature, Target 11, to protect 17% land and 10% ocean by 2020, has attracted much debate. One question is whether conventional protected areas are working, and if not why not? Another is whether the current percentage target is enough, and, if not, what space do we need to conserve, where and how? Or should we focus more on space outside protected areas, as per Target 5 to at least halve the rate of loss of natural habitats and significantly reduce degradation and fragmentation, Target 7 to sustainably manage areas under agriculture, aquaculture and forestry and Target 15 to restore at least 15% of degraded ecosystems? Calls for 'Half-Earth' or 'Nature Needs Half', focusing on protection, have recently been countered by a 'Whole Earth' approach, focusing on sustainable use. An ICCB symposium will address what we are prepared to lose and the potential role of inadequacy targets in conservation agreements. Participants at this session will explore such questions, following on from events organised by ZSL, IUCN and partners at the 2014 IUCN World Parks Congress and the 2016 IUCN World Conservation Congress, and will feed into a symposium at ZSL in spring 2018, to support the CBD's post-2020 negotiations. This will address IUCN Resolution WCC-2016-Res-096-EN, calling for "the development of an ambitious post-2020 strategy… which might include a review and expert meetings to define science-based targets for effective conservation of areas of greatest importance for biodiversity and ecosystem services".

SERRANÍA DE LOS YARIGUÍES ASSESSMENT AND RESEARCH OF ENDANGERED SPECIES AND CONSERVATION STRATEGIES

Diana Villanueva-Ceballos, Universidad Nacional de Costa Rica; Fundación Biodiversad; Jose Aguilar, Universidad Industrial de Santander; John Arias, Fundación ProAves; Yulied Bautista, Fundación ProAves; Thomas Donegan, Fundación ProAves; Blanca Huertas, Fundación ProAves; Juan Luna, Fundación ProAves; José Pinto, Fundación ProAves; Viviana Romero-Alarcon, Universidad Industrial de Santander

YARÉ Project is a conservation initiative which took place in the Serranía de los Yariguíes, a little-known part of Colombia. In its first phase which coincided with the declaration of a national park and nature reserves in the region, baseline surveys in various faunal groups and community work took place to inform strategies for the conservation of threatened species of the region. The first phase demonstrated the region to be critical area for the conservation of several endemic and threatened species. A second phase focused on establishing a conservation corridor that would allow connectivity of different protected areas in three municipalities. Reforestation with native trees and bushes in the conservation corridor involved active participation of the community and local landowners allowing reforestation of more than 300 hectares. The called 'Lengerke Path' – an historic but partially overgrown stone trail traversing the mountain range was recovered and reopened for ecotourism, with the help of various local stakeholders. The intention was using the path as an eco-route for guides and local communities. Rapid Biodiversity Assessments were conducted at four sites along the corridor that had not been explored biologically before, with important results such as new taxa and new locations for threatened species in plants, birds, butterflies, mammals and reptiles. Involving the community, it was possible to develop the eco-route corridor design, training member of the community as guides, environmental education with children, a migratory birds and biodiversity festival with elaborated materials to inform the community about its diversity. Although conservation efforts in the Serranía de los Yariguíes are an important step to ensure the habitat of threatened and endemic species in the region, it is still necessary to continue the involvement of local people and organizations in the region in developing strategies for biodiversity conservation of this unique place.

SPECIES COMPOSITION AND REGENERATION POTENTIAL OF RESOURCES FOR HOWLER MONKEYS UNDER BAMBOO LOGGING

Carolina Gomez-Posada, University of Washington; Melissa Alzate, Fundación Aiunau; Álvaro Botero-Botero, Universidad del Quindío; Esmeralda Fernández, Universidad del Quindío; Germán Gómez, Universidad del Quindío; Martha Groom, University of Washington;

Bamboo forests are widely promoted as an environmentally sustainable resource that generates income for farmers and that holds great biodiversity. Due to the frequent selective logging of bamboo, a careful analysis of their potential to support wildlife is needed to promote best management policies. In a highly fragmented montane region in Colombia, the last native forest remnants are bamboo forests under logging activities promoted by the government. Using the red howler monkeys (*Alouatta seniculus*) as a target species, we evaluated the effect of bamboo logging on the floristic composition of food resources for howlers in 14 bamboo forest fragments, comparing impacts from two logging types that dominate in this region. We also compared the logged fragments with the only protected unlogged bamboo fragment. We found a severe negative

impact of bamboo logging on the abundance and floristic composition of food resources for howlers. Disturbance due to logging favors only a small set of species, thus diversity within logged fragments was highly similar between logging types, but different from the protected forest. Logged fragments had lower plant diversity compared to the protected forest, due to mechanical damage during logging. The extremely short logging cycle (over two years) negatively impact the recruitment of some important key food species, such as Ficus, due to lower ability of seedlings and saplings to establish and recruit into mature size classes. Bamboo forests support howlers and other native fauna, which are currently relying on adult trees with low regeneration potential. Given the increase of bamboo forestry, we recommend including ecological requirements of other species in the silvicultural regulations if they are to provide an environmentally friendly alternative. Bamboo logging takes place around the world and in many countries, we hope our results would encourage studies on its impacts in other locations.

STRATEGIES FOR INCREASING HUMAN DIVERSITY IN AUTHORSHIP OF HIGH IMPACT PUBLICATIONS

Sacha Vignieri, AAAS; Science

Effective conservation is a result of several components, science, advocacy, integration and communication. Though improvements are being made, inclusion of under-represented groups and parties occurs across each of these aspects. Such under-representation is a disservice not only to these groups, but to science and impactful conservation overall. As the organismal biology editor at one of the top journals globally, I have witnessed that communication, in the form of publication, is an area where under-representation persists, despite sincere attempts at its reduction. In this knowledge café I will present strategies for targeting and preparing research for submission to high impact journals as an opening to brainstorming discussions about the ways in which diversity can be further enhanced in publication overall, alternative approaches for conveying results and messages that may help facilitate greater inclusion, and the future of scientific publishing and information exchange.

TACKLING CONSERVATION CHALLENGES THROUGH STORYTELLING

Jennifer Croes, Jennifer Croes Consulting and Jungle Jenn Productions Pty Ltd

The world is changing rapidly, and we are constantly faced with conservation challenges, in particular with the increasing threat of wildlife trade. Policy, regulatory mechanisms and lack of law enforcement do not result in cultural or behavioural shifts. Our disconnection to nature has proven to be much more difficult in reaching out to an audience. So how can we effect change in a conflicting world of balancing livelihoods, culture and conservation? How can we reach to the masses to campaign for change? Storytelling. Wildlife trade is a leading threat to biodiversity conservation and overexploitation of wildlife is having a significant impact on species' survival. Our insatiable desire to chase the next trend affects animals of all shapes and sizes. From owning exotic pets, to high-end fashion accessories to drinking the world's most luxurious coffee, it all has a price we didn't know existed. It's time to shift our conservation mindsets and build a movement and tell real stories based on data and facts through different mediums such as documentaries and virtual reality and take audiences on a journey to reconnect to conservation issues such as wildlife trade. Conservation storytelling brings difficult topical, conservation issues to light and make them translatable and accessible to a global audience to raise awareness. Stories have the potential to captivate and entertain a global community, where they can play a significant role in making decisions and campaign for change. In the first 3 short documentaries I have filmed, I investigate the impact of wildlife trade of lesser-known or 'non-charismatic' species to meet consumer trends and demands, and the price wildlife has to pay. It aims to transform the way people think about the environment and the role it plays in our everyday lives. In my current public mobilisation and campaigning projects, I rely on real life stories based on fact, to engage and move audiences and shift mindsets.

THE IMPACT OF A LONG-TERM SPECIES-BASED CONSERVATION PROGRAM IN BRAZIL: THE BLACK LION TAMARIN CASE

Gabriela Rezende, IPÊ - Instituto de Pesquisas Ecológicas; Claudio Padua, IPÊ - Instituto de Pesquisas Ecológicas;

Success in conservation relies on countless factors, such as systematic conservation planning, appropriate choice of strategies and practicing of adaptive management. The ability to develop creative and innovative solutions to overcome the daily challenges of a constantly-changing world is imperative to achieve real and lasting impact. The Black Lion Tamarin Conservation Program, developed by IPÊ – Institute for Ecological Research in Brazil, has built over the last three decades a successful integrative and interdisciplinary approach. Here we present the results of this long-term program that considers applied conservation field research as the groundwork for planning management actions at the population, habitat and landscape levels, together with community

involvement. Researches resulted in more than 10 black lion tamarin (BLT) populations discovered and a new population established through translocations, as part of a Metapopulation Management Plan. Field data have subsidized the elaboration of an environmental suitability regional map, which indicates priority areas for forest restoration, from which we could restored the largest forest corridor in Brazil, with 1,200 hectares connecting two Atlantic Forest remnants to enhance the BLT survival. In the policy realm, our studies led the government to create the BLT Ecological Station. Community involvement actions have approached more than 10,000 people via the environmental education program and generated income to the local families through sustainable alternatives, such as the 22 community nurseries that produce seedlings to restore landscape connectivity; the Agroforestry Systems ("Coffee with Forest") on 52 small farms; the production of environment-themed handicrafts by the local women. The three-decade work has upgraded the BLT from "Critically Endangered" to "Endangered" in the IUCN Red List and made this species the symbol for the conservation of the extremely threatened Atlantic forest of São Paulo.

THE TABOO DIALOGUE: INDIGENOUS PEOPLES, CONSERVATION AND LAND RIGHTS

John Goedschalk, Conservation International; Gwendolyn Smith, ATTUNE

There is increasing evidence that the stewardship role of indigenous peoples has contributed to the current existence of intact forest in the Amazon region. Operating from a traditional worldview, indigenous people have found a way to balance between caretaking and using the forest for their livelihood. Bridging this unique approach with conventional, science-based conservation methods has been difficult and remains a challenge today. The task is to bridge the differences in communication, align different perceptions about the human-forest relationship and link the interests of indigenous peoples with other stakeholders. Increasingly, however, the rights of indigenous peoples populating forested areas is under pressure and discussing this important topic often is excluded from formal dialogues about forest management. We argue that a participatory methodology founded on the principles of conflict resolution can create enough space to discuss legal rights to indigenous land use and ownership. With a case study of Suriname, a country without an official land rights and tenure framework, we demonstrate how an open dialogue led to a unified co-management system of 7.2-million-hectare of tropical rainforest. Ultimately, this intact forest contributes to a number of services besides protection, such as climate change mitigation, safeguarding headwaters and watersheds and preservation of indigenous cultures and livelihoods.

THE URBAN CHALLENGE: LATIN AMERICAN CITIES AS HOTSPOTS OF OPPORTUNITIES FOR BIODIVERSITY CONSERVATION

Juan Amaya-Espinel, Instituto Alexander von Humboldt - Pontificia Universidad Javeriana; Juliana Montoya, Humboldt Institute

The accelerated rate of urban growth in Latin America represent a contrasting duality of challenges and opportunities for the biodiversity conservation. First, for the negative effects that this process could have on the structure and functioning of natural ecosystems, the survival of multiple groups of fauna and flora and their participation in ecosystem services delivery closely linked to the urban dwellers well-being in this development countries. But on the other hand, also for the significant opportunities that these cities could be still offering for reducing the rate of loss of biodiversity in this part of the world. The growing interest for address these challenges and opportunities for biodiversity conservation in Latin American cities has been promoting an increasing series of descriptive studies and quantitative analysis. In addition to process to incorporate biodiversity as a strategic element in processes of urban planning and environmental management in multiple cities of this region. This knowledge café seeks to: a) contribute to a better understanding of the importance of cities into biodiversity conservation in the Latin America region, b) identify and discuss advances, learning lessons and the most relevant challenges towards integral conservation of biodiversity in urban areas on this part of the world, and c) facilitate a space to puts in contact conservationist, urban planners as well as decision makers in order to create a Latin American network for Urban Biodiversity Conservation that guides a future joint process of research, action and collaboration. To achieve this goal, this knowledge café will promote a discussion about conceptual and practical developments, as well as various case studies to address comprehensibly the ecological, social, economic and political aspects that converge around the conservation of biodiversity in Latin American urban areas.

THINKING OUTSIDE THE NETWORK: BROADENING PARTICIPATION IN CONSERVATION TECHNOLOGY

Alasdair Davies, ZSL; Eric Fegraus, Conservation International; Stephanie O'Donnell, Fauna & Flora International

Technology offers enormous potential in securing a sustainable future for the planet. However, the conservation community faces a significant challenge in making sure these technologies are affordable and available to users around the world, and ensuring that people have the knowledge to use these tools properly. Even technologies that have already demonstrated their worth in the field must be adapted to specific social and environmental conditions, and require local buy-in and ownership. A number of efforts to improve access to affordable, reliable technology tools have emerged over the last few years, with different conservation tech groups and initiatives attempting to engage with the technology sector, map and forecast needs, and shape the development priorities. Yet these conversations often lack a diverse, representative pool of participants. In order to magnify the impact of our work, we need to empower global networks in the conservation and tech spaces to co-develop their own solutions. How do we change this approach so that the question/focus isn't simply about democratising access to cheap, reliable tools, but also about democratising access to the strategic, priority setting conversations - ensuring that they are open, inclusive and utilise the diverse expertise that exists in the global conservation technology network. During this knowledge café we shall consider several key questions with the aim of understanding how we can empower a greater diversity in participation in the development of new applications of technology for conservation. Where are our efforts best focused to achieve this goal? We will consider what is already being done to empower global networks to develop their own solutions; identify key local experts or collectives that could be consulted or supported; map the barriers to participation in current conservation technology discussions and developments; and map practical next steps to address this issue.

URGENT STRATEGY TO RECOVER A FUNCTIONALLY EXTINCT POPULATION OF LEARS MACAW AND RESCUE ITS HABITAT

Thiago Filadelfo, Lear's Macaw Research and Conservation Project; Erica Pacífico, Estación Biológica de Doñana

The Lear's Macaw is endangered and endemic to the Caatinga Dry Forest of northeastern Bahia, Brazil, one of the most neglected biomes in the country, with only 1,4% of its original extent formally protected. The species currently occurs in two eco-regions, 230 km apart. The Raso da Catarina region holds 114 breeding pairs concentrated in cliffs protected by an NGO and local farmers. In the Boqueirão da Onça region, only two individuals remain from a larger macaw group (ca. 30) that was drastically reduced in the 90's due to illegal trade and hunting. Living in isolation for 15 years, the non-breeder macaw pair represents a functionally extinct population. Despite its classification as an Important Bird Area and of being a priority area for Caatinga conservation due to its endemic/endangered plant and animal species, including the largest population of Jaguars (*Panthera onca*) in the biome, the Boqueirão da Onça is not protected. Since 2002, a project to create a National Park is under evaluation by the Environmental Brazilian Agency, yet wind energy and mining industries are also occupying parts of region. Between 2012 and 2016, we conducted five ten-day surveys in the region to find the macaw's roosting sites and to collect molted feathers for genetic and health studies, with no success due the inaccessibility of the area that limited our mobility and capacity for following the macaws. We suggest that the release and monitoring by telemetry of captive-born juveniles, together with a strong educational program to minimize the local extinction causes could be a first step toward recovery. A potential interaction between remaining macaws and released individuals could be highly beneficial for the establishment of the latter, and could help conserve the home range memory of the remaining individuals, as well as find and protect their roosting sites, reinforcing the creation of the Boqueirão da Onça National Park, and so it should be urgently implemented.

WAYS FORWARD TO MANAGE SMALL-SCALE FISHERIES IN THE COLOMBIAN PACIFIC COAST

Gustavo Castellanos Galindo, WWF Colombia; Rodrigo Baos, WWF Colombia; Lina Saavedra-Díaz, Universidad del Magdalena; Luis Zapata, WWF Colombia

Despite being historically isolated and marginalized, the Pacific coast of Colombia has played a pivotal role in sustaining the Andean developed economy of the country, e.g. providing raw materials such as timber and fishery products. More than two thirds of Colombian fisheries catches come from its Exclusive Economic Zone in the Pacific that except from tuna and shrimps are commercialized locally. A declining industrial fishery has led to a change in focus by stakeholders to the more diverse small-scale fishery (SSF) in this coast. Here we examine the main challenges faced in managing SSF in the Colombian Pacific coast and provide a perspective on key issues to be solved in order to achieve long-term sustainability. Government attention to small-scale fisheries in the Pacific is unlike to change in the short and mid-term if drastic changes are not made to how national fisheries policy is conceived. Pressing issues to achieve sustainable management are: (1) the development of methods to assess the status of data-poor stocks in this coast, (2) the establishment of a community-based fisheries monitoring

method that is effective and consistent over time, (3) creating market-based mechanisms that could alleviate fishing pressure on certain stocks, (4) building a fisheries management strategy by communities in cooperation with government, (5) inserting into the sustainability agenda the important role that artisanal fisheries have for food security and poverty alleviation in one of the poorest regions of Colombia under the Human Rights umbrella endorsed by the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in 2015. Addressing each of these aspects with adapted strategies to the particularities of the Pacific Colombian coast might bring hope to the long-term provision of fisheries resources in Colombia.

WHAT COMES TO OUR MIND WHEN WE THINK ABOUT BIODIVERSITY?

Raúl Rodríguez-Cano, Pontificia Universidad Javeriana

The way we interpret environmental problematics is mediated, among many other aspects, by the referents a society, a collective or an individual has in order to be able to define "nature". The discourses about nature and biodiversity are configured as a perpetual dispute scenario, since the knowledge construction process is traversed by relations of power, manifested through the restrictions and/or lore openings and experiences in the processes of interaction with the natural surroundings, in specific space-time contexts. In this sense, determining how the discourses have manifested and transformed in the construction, research and divulgation of conservation and usage strategies, in the interest of complying with the current environmental challenges, stablishes a challenge for biological conservation as it implies reflecting on the way these discourses affect the intervention practices and the production of knowledge. The mass media, television among them, inserted itself in the different societies as a mediating axis between the production and circulation of representations (images, concepts), practices (educative, research, informative), and nature and biodiversity knowledge, promoted an expression scenario for that dispute as well as the creation of an "environmental conscience". As a consequence, it is necessary to understand the conditions by which emerge these environmental and media discourses, which influence the (political, social, environmental, and economic) agendas of the countries, create society interpretation models, insert themselves in political debates and decant in the ways of interaction with biodiversity. I make a critical approximation to the ways for constructing meanings in contemporary cultures as expressions of social reality in which the current environmental problematics are registered, seen as a contribution to the challenges of biodiversity conservation and its complexity.

WORLD HERITAGE SITES HELPING OR HINDERING CONSERVATION

Wendy Jackson, New Zealand Department of Conservation; Jon Kohl, PUP Global Heritage Consortium; Alison Ormsby, University of North Carolina - Asheville

Over 230 World Heritage sites have been designated based on their natural features – such as on-going ecological and biological processes, and natural habitats for in-situ conservation of biological diversity – and/or a mix of natural and cultural features. This knowledge café will explore questions such as the following: Has World Heritage designation of these properties been a significant contributor to site-based conservation? What opportunities and challenges have emerged through World Heritage status? What impacts has World Heritage designation had on the site? During this knowledge café, we hope to engage conservation practitioners and stakeholders involved with or interested in World Heritage sites. We welcome participants from all regions and interest areas. Potential topics of exploration include site management, policy challenges, effects on wildlife and ecosystems, tourism and cultural impacts, monitoring and reporting, and stakeholder engagement. The organisers view this knowledge café as an opportunity to develop valuable and constructive connections among those interested in and working on World Heritage sites.

A GLOBAL PERSPECTIVE OF LOCAL AND REGIONAL-SCALE AQUATIC ECOSYSTEM CONSERVATION AND MANAGEMENT

Jorge Celi, Universidad Regional Amazónica IKIAM; Priyadarsanan Dharma Rajan, Ashoka Trust for Research in Ecology and the Environment (ATREE); Stephanie Januchowski-Hartley, Paul Sabatier University; Sukhmani Mantel, Rhodes University; Helen Barber-James, Albany Museum

Approaches to aquatic ecosystem conservation and management vary regionally and globally. The question is, should we define specific mechanisms that fit different needs of people and ecosystems in different regions of the world, or apply similar policies and management to address common problems? The goal of this workshop is to compare and contrast steps or approaches followed in several regions of the world, assess what works and what does not, and discuss common challenges and ways to overcome them. We will begin with four short talks (total 20 min long) that will draw on local to regional-scale examples to compare different frameworks and approaches commonly used in freshwater conservation policy and management across the globe. This will be followed by a 30 min long active discussion where we will categorize other experiences along a continuum of approaches and factors, and finalized with concluding remarks (10 min long) about knowledge gaps and best practices for aquatic conservation for different circumstances.

A MANIFESTO FOR PREDICTIVE CONSERVATION

Matthew Selinske, RMIT University; Sarah Bekessy, RMIT University; Mark Burgman, The University of Melbourne; Francesca Mancini, University of Aberdeen; Sean Maxwell, The University of Queensland; E.J. Milner-Gulland, University of Oxford; Anca Serban, University of Cambridge; Henry Travers, Oxford University; James Watson, Wildlife Conservation Society, University of Queensland

"To successfully address the current rate of biodiversity loss it is essential to anticipate the challenges of a rapidly changing world and use predictions to shape the design of conservation interventions. In recent years, interdisciplinary predictive approaches have been tested by conservation scientists, but these approaches are yet to be applied systematically to frame conservation problems or inform management decisions. In the context of climate change and rapid economic development in biodiversity rich countries, predictive approaches can identify emerging threats and quantify risks. Increased attention is being given to evidence-based approaches, but management decisions are still often based on subjective judgments or perceived best practice, leaving them open to bias and vulnerable to failure. Predictive approaches allow practitioners to estimate the effectiveness of conservation interventions prior to implementation while accounting for local context and minimising the risk of policy failures. In this workshop, we will review predictive methods, showcase how these novel approaches can be used by researchers and practitioners, and discuss methods used by other disciplines that may have applications in conservation. An expert panel, leading figures in conservation science, will discuss the potential of predictive approaches, followed by a 30-minute general discussion with the audience and panel members. The workshop is organised and chaired by early-career researchers."

ADDING VALUE TO CONSERVATION POLICY: WORK OF SCB'S REGIONAL SECTIONS AT THE SCIENCE-POLICY INTERFACE

Stefan Kreft, Eberswalde University for Sustainable Development; Sarah Reed, Wildlife Conservation Society, Colorado State University

In our interactive networking session, we want to explore how SCB members and ICCB attendees can become involved in policy-related work by the regional sections of SCB. The Society for Conservation Biology (SCB) is a global professional society seeking to advance the science and practice of conserving biological diversity. A major

focus of SCB's strategic plan is to "increase application of science to management and policy." Effectively bridging the gap between conservation science research and implementation requires reaching out not only to fellow scientists, but also to decision-makers. It is therefore more and more important for scientists to take an active role in ensuring that their knowledge is incorporated effectively into policy. Several groups within SCB are already valued partners at the science-policy interface, including the SCB North America and Europe Policy Committees as well as the Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES) Subcommittee. In recent years, other SCB sections have followed these examples, becoming increasingly innovative and effective policy advocates. This workshop will report results of a strategic analysis of SCB's engagement in conservation policy, highlighting the Society's strengths and organizational niche, the preferred scope and scale of policy engagement, and possible future role for SCB and its members in conservation policy. In addition, representatives of various SCB groups will share their experiences with engagement in diverse policy initiatives around the world. The workshop will conclude with an interactive networking session for SCB members and ICCB attendees to learn more about how to get involved in future policy issues, with a focus on work of SCB's regional sections."

ADOPTION OF EBA IN THE FACE OF CLIMATE CHANGE: IMPROVE LIVELIHOODS AROUND WOROBONG FOREST RESERVE

Conrad Kyei-mensah, University of Ghana; Rosina Kyerematen, University of Ghana

Forest ecosystem services are key to the lives of forest-dependent communities such that extreme activities within the forest reserve will not only expose the people, but also compromise forest ecosystem health. Climate change is also expected to exacerbate it. Ecosystem-based adaptation (EbA) is recommended by UNEP as an approach which uses biodiversity or ecosystem as part of the overall adaptation strategy to reduce vulnerability of the people and ecosystem to the impact of climate change. Learning Objectives:

- Determine the various forest ecosystem services of the WSFR
- Identify the drivers of forest ecosystem services loss (human and climate change)
- Suggest EbA strategies that ensures sustainability of the ecosystem services and livelihoods of the people.

This workshop will offer attendees the opportunity to examine some of the ecosystem services from the tropical forest reserve of Ghana, their significance to the people, the extent of abuse and impact of climate change. It will also lead to the exploration of pertinent strategies for overcoming these challenges. Extreme human activities coupled with climate change will render forest ecosystem and communities dependent on it vulnerable. Ecosystem-based adaptation (EbA) as an adaptation option is considered appropriate in sustaining the forest ecosystem and livelihoods. This workshop will use a case study of the Worobong South Forest Reserve in Ghana to explain the ecosystem services of the forest, abuse, and role of climate change as well as the appropriate strategies to address the challenges."

BRIDGING THE GAP BETWEEN SCIENCE AND PRACTICE FOR CONSERVATION IN THE SPANISH SPEAKING WORLD

Eduardo Gallo-Cajiao, University of Queensland; Duan Biggs, University of Queensland

Communication, as the strategies and tools to disseminate information, is central to conservation practice. Within the conservation community, there has been increased recognition of the imperative need to bridge the gap between the scientific community and the public sphere, including managers, decision makers, and the general public. In this context, publication outlets specifically tailored to target those audiences can help fill this gap. In the English-speaking world, progress has already been made in this front, with well-established magazines circulating now, such as "Anthropocene" published by the University of Washington since 2000 under various names. However, despite there being over 500 million native Spanish-speakers in regions of the world harbouring globally important biodiversity under multiple threats, no magazine to date is available for this purpose. Through this workshop, we aim to present and discuss a plan to establish a "popular" conservation magazine in Spanish, targeting the Neotropical region. Since 2015 Decision Point, the "popular" conservation magazine published by the Environmental Decisions Group at the University of Queensland (Australia), has been produced in Spanish once a year. Through this process we have engaged a large audience across the Spanish speaking world, and more importantly, have identified not just the need for it, but also appetite amongst scholars and practitioners. Hence, we are inviting key stakeholders (i. e., NGOs, government agencies, and research institutions) from Latin America to discuss and explore ways forward to further expand this publication to create a widely-read, popular interest, conservation publication for Spanish speakers into the future. It is expected that this workshop will lay the foundations to create an inter-institutional effort to

help bridge the gap between conservation science and conservation practice in one of the most important regions of the world for biodiversity.

CIVIC ENGAGEMENT IN CONSERVATION BIOLOGY

Jacqualine Grant, Southern Utah University; Kimberly Terrell, Memphis Zoo

Civic engagement is the use of knowledge, skills, and values, to develop motivation to make a positive difference in communities through political and non-political processes. The goal of this workshop is to teach participants how to integrate civic engagement into their conservation practice regardless of the venue in which they work. Because conservation science must inform local, national, and international efforts, conservation scientists must be able to engage themselves and their communities in civic life. Participants will be introduced to what is meant by "civic engagement" in a 15-minute introduction in which we will review the Association of American Colleges & Universities (AAC&U) learning outcomes and rubrics associated with Civic Engagement. Participants will learn about civic engagement through two examples, one that focuses on the undergraduate conservation biology classroom (15 minutes), and one that focuses on a local zoo (15 minutes). The session will conclude with a 15-minute discussion on how to integrate civic engagement into the practice of volunteers from the audience. The organizational structure is a 60-minute-long workshop with two leaders and up to 24 participants. The workshop will occur during lunch break and requires access to a projector and computer. If possible, the presence of six easels with poster pads of paper and markers would enhance the interactive components of the workshop."

CONSERVATION IN COLOMBIA, FROM THE RURAL AND ENVIRONMENTAL STUDIES: STUDIES FROM THE PAST 10 YEARS

Maria Echeverry-Galvis, Pontificia Universidad Javeriana; Juan Benavides, Pontificia Universida Javeriana; Juan Ricardo Gomez, Pontificia Universidad Javeriana

Conservation, as a tool for development, sustainability and the maintenance of the socioecological interactions, requires a multidisciplinary approach with different scales of temporal and regional analyses. From its start, 20 years ago, the Faculty of Environmental and Rural Studies, has being studying and leading the research on both the ecological aspects and the social conditions in various regions for the country, engaging in resources conservation from the local to the national perspective. With this workshop, we aim to share some of the most recent works developed in Colombia that exemplify different methodological approaches to understand, answer or propose effective conservation actions. We aim, to spark interactions as to how some of the approaches and methodological proposals can be further implemented under current scenarios of conflict between conservation and social conditions in the territories. Overall, by sharing multiple experiences and briefly discussing some of the successes and challenges when taking conservation as a force for development and regulation of resources, we look to new areas in which the country needs further information, analysis or collaborative work to undertake actions that lead us to a better resource management, taking into account ground-based knowledge, as well as current theoretical approaches on conservation. We will present four short talks covering gender perspective, ecotourism, ecosystem functioning an others, as a conservation measure.

DATA RICH BUT INSIGHT POOR? HOW TO USE DATA SCIENCE TO EMPOWER MANAGEMENT AND CONSERVATION

Fernando Cagua, University of Canterbury; Nancy Bunbury, Seychelles Islands Foundation; Tim Robinson, University of Wyoming

"Data Science, ""the responsible use of data for decision making"", has been embraced by companies in many fields for optimizing their processes and improving management. The similarities with good practices in conservation are striking because successful management of natural resources invariably involves making data-driven decisions in complex shifting social and ecological settings. To support this decision making, environmental management agencies often establish monitoring programs that provide information about the status and trends of the resources of interest. While monitoring and management frameworks outlining how data can be used for decision making are well established, cases of data being collected—but not used—occur too frequently. Regrettably, small or underfunded organizations are more likely to be in this ""data rich but insight poor"" situation. Managers are often acutely aware of this disconnect but are unable to address its root because data management, manipulation, and analysis, are often more complex and expensive than anticipated. In this workshop, we will show how relatively simple data science and business intelligence tools can be used to bridge this gap and create an efficient data workflow. With the right systems in place, automated reports and user-friendly interactive web apps can provide real-time statistical summaries and visualizations, not only of the raw data but also, of how it relates to the actual

resource(s) being managed and associated conservation values. Managers and scientific staff can have a direct and immediate overview that allows to quickly identify areas requiring improvement or more in-depth analysis. We will outline both the general principles and the technical aspects of efficient data management and demonstrate, using examples, how NGOs, citizen groups, and virtually any data-dependent agency can benefit from a data science perspective."

DEFINING A CONSERVATION PLANNING TOOLKIT

Patrick Crist, Natureserve; Eddie Game, The Nature Conservancy; Nick Salafsky, Foundations of Success

Conservation planning is an incredibly complex endeavor especially now with the imperative to incorporate climate change and human well-being. Most organizations rely on a small group of experts and one or two software tools to conduct this work which is often not reproducible or extensible. This session will introduce an initiative to map a core set of existing tools to a conservation planning work flow that would comprise a conservation planning toolkit. This session will lay out the workflow to be supported by the toolkit and a straw man selection of tools for discussion, identification of additional or alternative tools, and needs for guidance and training to support application of the toolkit by a broader group of practitioners. This workshop will support efforts to develop a core toolkit applicable globally by incorporating insights from SCB members.

DISCOVER, MAP, AND COLLABORATE: APPLYING SPATIAL DATA TO CONSERVATION CHALLENGES USING ONLINE TOOLS

Tosha Comendant, Conservation Biology Institute; Gladwin Joseph, Conservation Biology Institute; James Strittholt, Conservation Biology Institute

In this workshop, participants will have the opportunity to explore Data Basin (now available in Spanish); an open-access, online mapping and collaboration platform built to support conservation planning, prioritization, and resource management decisions. Data Basin provides access to well-documented spatial data and provides user-friendly tools for visualizing, analyzing, and co-producing knowledge. Using an interactive format, the workshop will provide a basic overview of how to download/upload data, create maps, join or start groups, and share expertise on specific topics or regions. We will use case studies to demonstrate how Data Basin can be used to break down barriers to collaboration and negotiation for scientists, conservation practitioners, decision-makers, and stakeholders affiliated with governments, universities, non-profits, tribes, corporations, and the public. By the end of the workshop, participants will know how to explore existing spatial data, create maps and drawings, and access tutorials. Workshop participants will gain access to a social network of 16,500+ users and 20,000+ biological, physical, and socioeconomic datasets at multiple scales. Data Basin limits the time and resources often required to find and acquire data, modify file formats, and/or purchase and learn proprietary software. Unlike conventional mapping tools, Data Basin was designed to offer integration and collaboration tools for a non-GIS trained audience. Since it launched in 2010, Data Basin has helped move mapping and conservation science products out of the exclusive domain of technical experts. Data Basin was build with the strong conviction that we can expand our individual and collective capacity to develop sustainable solutions by empowering conservation practitioners, decision-makers, and stakeholders through better access to spatial data, non-technical tools, and collaborative networks.

DRAFTING BEST PRACTICE GUIDELINES FOR ENGAGING FAITH COMMUNITIES IN CONSERVATION PROJECTS

Jame Schaefer, Marquette University; THEOLOGY

Guidelines for the three-year Best Practices Project initiated by the Religion and Conservation Biology Working Group (RCBWG) of the Society for Conservation Biology will be drafted during this workshop. Positive outcomes of practices reported by SCB members in the Best Practices Survey (May 31-September 10) and by participants during the New Hope for the Oceans forum sponsored by the RCBWG at the International Marine Conservation Congress on July 31 will serve as initial ideas to consider. Though ideas from other professional conservation organizations that have developed guidelines for their members to follow will also be made available as examples, the focus of this workshop will be on SCB members drafting guidelines they think are most fruitful for SCB members to consider when planning and carrying out conservation research and practice. The drafted guidelines will be revised subsequently and submitted to the SCB Board of Governors by January 2018 for promulgation and promotion through SCB communication channels. Future plans include proposing workshops on the guidelines at regional SCB meetings during the summer of 2018. This workshop should follow the proposed symposium (Engaging Faith Communities in Conservation Research and Practice) during which selected SCB members who responded to the Best Practices Survey are showcased as examples of successful engagements initiated by conservation scientists and practitioners with

leaders and members of faith communities to yield positive outcomes of projects.

EARLY CAREER INTERDISCIPLINARY RESEARCH AND PRACTICE EXPERIENCE EXCHANGE: LOOKING TO THE FUTURE

Federico Davila, The Australian National University; Rebecca Jarvis, Institute for Applied Ecology New Zealand, Auckland University of Technology; Claudia Múnera-Roldán, Australian National University, Fenner School of Environment and Society

This workshop will bring together diverse knowledge and experiences from early career social scientists working in conservation and sustainable development. The aim of the workshop is to identify and discuss common mistakes, challenges, and opportunities in conducting rigorous social science research, and identify new pathways to better integrate conservation concerns into policy and development programs. We will not only explore how we can make conservation more effective, but also how integrated research and practice can help us achieve a more equitable and sustainable world. This workshop targeted at early-career researchers and practitioners from any region. We will facilitate the discussion on how conservation and development issues can be better integrated. We will also allow for experiences on conducting interdisciplinary conservation research to be exchanged, with the aim of looking at future ways for bridging biodiversity conservation, social development, politics, and environmental change. Workshop organisers will provide their experiences as interdisciplinary early career researchers working in human ecology and socio-ecological systems, in the context of food security and marine conservation. Workshop participants will be encouraged to discuss different knowledge systems, critically examine emerging methods, discover opportunities for future collaboration, and identify research priorities that can better contribute to conservation and development challenges. Together, we will identify future strategies to develop truly interdisciplinary research and practice that will help achieve our global conservation targets and sustainable development goals.

FAITH-BASED CONSERVATION 2.0: EXPLORING NEW DIRECTIONS IN THEORY POLICY AND PRACTICE

Fabrizio Frascaroli, University of Zurich; Dekila Chungyalpa, YETI, Yale University

1.1 Goal: to further dialogue and collaboration between faiths and conservation by: (1) outlining a theoretical framework for defining and communicating faith-based conservation; (2) recognizing implications and opportunities for policy; and (3) setting an agenda for future research and action. 1.2 Rationale: interest in the relation between spiritual traditions and ecology has increased steadily for three decades and received new momentum in recent years. Environmental initiatives led by religious institutions or based on partnerships with conservationists have grown accordingly. However, these developments have not been complemented by similar progress at the level of research, policy and theory. Consequently, we have yet to agree upon common nomenclature that bundles such initiatives. 'Faith-based conservation' is frequently used as a general label: if we are to further define it, we need to clarify its parameters, measures of success, and how it overlaps with or differs from other approaches (e.g., community-based and biocultural conservation, indigenous rights and knowledge). Such a gap is not merely theoretical, as it can result in missed opportunities for analysis, collaboration and policy. This session will explore these and similar critical issues. As such, it will help develop the long-term strategies and conceptual underpinnings that are necessary for a new wave of faith-based conservation and all of its potentials to fully come true.

GOT CAPACITY? EVALUATING CAPACITY DEVELOPMENT ACTIVITIES TO SHOW IMPACT

Stuart Paterson, Fauna and Flora International, Andrea Santy, WWWF; Eleanor Sterling, American Museum of Natural History

Local participation in natural resource management is critical to the long term conservation of biodiversity. And in today's changing world, it is more crucial than ever that conservationists gain the skills and knowledge they need to address environmental challenges in their home countries. Capacity development (CD) activities are a common activity in most projects yet there is no agreed upon indicators to measure the impact of CD on conservation. Therefore, CD is often seen as having no direct impact. However, those committed to CD know that the benefits and impacts are generally understated. The impact on conservation is clear and by measuring its effectiveness, we hope that this session will provide a new framework for understanding and measuring these impacts and lead to more effective training and capacity building programs. Currently, most capacity development efforts are evaluated in terms of inputs, reaction, and immediate outputs; there are few examples where behavior change, and impacts are measured. As a result, and despite a growing range of tools, mechanisms, and criteria for capacity development evaluation, it is difficult

to evaluate fully the impact that capacity development strategies and interventions have had on conservation. Hence, there is a critical need to develop more rigorous, measurable, and impact-focused systems for evaluation of capacity development that are flexible, given the wide range of capacity development venues. This workshop aims to share methods to evaluate CD that will help participates begin to build a case for why their capacity building programs are essential to the long-term success for conservation projects worldwide. The session seeks to engage each participant and create an open and collaborative environment to share successes, challenges, best practices, and exchange ideas.

HOW TO REPORT ON THE COSTS OF CONSERVATION INTERVENTIONS FOR BETTER CONSERVATION DECISIONS

Gwen Iacona, University of Queensland; Bonnie Mappin, University of Queensland

Goal: Conservation decisions require good data on the costs of conservation interventions. This workshop will train participants in standardized reporting practices that will allow published management intervention cost information to be interpretable and transferable. Justification: Quantifying the cost of management interventions is critical for incorporating cost effectiveness into conservation decisions, but haphazard and inconsistent reporting has hindered the utility of most cost data. We created standard approaches for cost reporting to enhance the ability to identify cost effective conservation intervention by including details that allow for transparent interpretation and transfer of the data. We are calling for these standards to be adopted by the major conservation organizations, conservation science institutions and journals so that cost measures are comparable between studies and can contribute to a corpus of data that can be used to support conservation decisions. Organizational structure: This workshop is targeted at researchers and practitioners who are involved in projects that include measuring or describing the costs of conservation management actions. We will start the session with a brief overview of why standardized conservation cost reporting is important and then describe the reporting standards and worksheet that we will be using. Participants will then be guided through hands on reporting of example data sets using the standards, and will be encouraged to practice reporting on their own studies.

HUMAN-CENTERED APPROACHES TO INVASIVE LIONFISH CONTROL

Jennifer Chapman, Blue Ventures; Marc Fruitema, Blue Ventures; Steve Rocliffe, Blue Ventures

Across the Caribbean, the invasion of red lionfish (Pterois volitans) poses a pervasive threat to marine ecosystems and coastal fishing communities. With high fecundity, a lack of predators and a generalist diet, lionfish have spread so rapidly and widely across the region that eradication is unlikely to be possible. Most of the control strategies that have so far been employed have depended on recreational divers or conservation organisations. However, funding constraints make consistent year-round control challenging. Effective control may therefore best be achieved in the long-term by designing self-financing programs that support consistent high-volume removal. Market-based strategies that incentivise lionfish removal present opportunities for fisheries diversification, alternative livelihoods development, and growth in sustainable tourism in affected communities. However, since this can create economic dependency on lionfish, and because invasive species management is a field wrought with unintended outcomes, there is a risk that local communities may be negatively affected by such strategies. Taking a coupled human and natural systems approach to lionfish management, this session will bring together a diverse array of speakers to discuss sustainable approaches to lionfish control that maximise benefits to coastal communities, as well as to explore transferable lessons learned that can inform control efforts across the Caribbean region.

ICCB DIVERSITY, EQUITY AND INCLUSION FORUM: CONSERVATION, INDIGENOUS PEOPLE AND COMMUNITY LEADERS: FROM RIGHTS TO NATURAL RESOURCE MANAGEMENT

ICCB 2017 Diversity, Equity and Inclusion Committee; Danilo Villafañe, Arhauco people leader; Dalia Mina, Consejo Comunitario of Yurumaguí leader; Martin von Hilderbrand, Fundación Gaia Amazonas

Indigenous peoples and local communities hold formal rights to 18 percent of global lands — representing well over 20 percent of forest carbon stores and much of the Earth's biodiversity (Nature Conservancy 2017). With their important traditional knowledge and vast experience in environmental stewardship, indigenous peoples and local communities are uniquely positioned as conservation stakeholders, advocates and leaders. An interdependence exists between indigenous/ local communities and the natural world, yet complex challenges including the development of natural resources and climate change are

threatening the environments on which their livelihoods and cultures depend. These challenges are further complicated by globalization and expanding economic and market forces; a task that requires cooperation and partnerships. It is clear that local communities and indigenous peoples have been recognized; but it is also clear that legal recognition does not mean that the rights, territories, resources and cultures are respected. This recognition has not always translated to inclusion in decision making processes in which their livelihoods and cultural integrity may be jeopardized. Governments, corporations, loggers, campesino farmers, cattle-ranching companies and many others still covet their land and resources, and continue to find ways to acquire them. The plenary will discuss potential synergies between indigenous/local communities and conservation biologists. What are the strategies of indigenous and traditional peoples to sustainable management of their resources, and how can these strategies help to maintain, use, and strengthen their traditional ecological knowledge? How have they overcome obstacles? What are the main issues they still face? What can we do as part of conservation organizations to help? How can we fully respect indigenous and traditional peoples' human and development rights, and recognize the importance of conservation of their cultures as we work towards species conservation goals?"

IMPLEMENTATION OF A TWO-SEX, NONLINEAR, AGE-STRUCTURED METAPOPULATION PVA WEB APP

Wayne Getz, UC Berkeley

Many conservation biology practitioners would like to carry out Population Viability Analyses (PVA) easily and rapidly, without needing to purchase, set up, or learn to use a software package such as RAMAS or Vortex. In this workshop, we demonstrate the use of a PVA web app that can be accessed on any device (desktop, laptop, pad or smartphone) that supports a web browser. This PVA app, which is freely available at http://www.numerusinc.com/webapps/pva, allows for the specification of one to ten age classes, one or two sexes, single population or metapopulation configurations with 2 or 3 subpopulations, as well as density-dependent settings for inducing region-specific carrying capacities or male territoriality. Movement among subpopulations can be influenced by age, metapopulation connectivity, and attractivity of regions based on the relative fitness of the youngest age classes in each region. Simulations can be carried out deterministically or stochastically, with a user-specified combination of demographic and environmental processes. The user enters data either by selecting various options and filling in life history and movement parameter values online, or by importing a CSV file that was saved from a previous session. The app includes default CSV data files for a classroom study on the viability of Isle Royal wolves, as well as an illustrative rhino study. A preprint containing a full description of the app can be downloaded at http://biorxiv.org/search/Getz, or a published version of this preprint can be downloaded from the journal Natural Resource Modeling (Wiley, 2017). The app itself was constructed using the Nova model building platform (https://www.novamodeler.com/), which can be used to modify and extend the model to include an any required number of age-classes and subpopulations, as well as include additional ecological processes impacting the viability of a population of interest.

IMPROVING CROSS-DISCIPLINARY COMMUNICATION: AN INTRODUCTION TO THE TOOLBOX DIALOGUE METHOD

Marisa Rinkus, Michigan State University; Michael O'Rourke, Michigan State University

Conservation biologists regularly work with researchers from other disciplines as well as community members and other stakeholders. The potential for misunderstanding is rife, and the consequences of misunderstanding can be great. The Toolbox Dialogue Initiative, US NSF sponsored project, is an established way of enabling heterogeneous groups to avoid debilitating misunderstandings. This method uses a dialogue-based approach to enhance communication and collaboration in cross-disciplinary science teams. Grounded in philosophical analysis, the workshop enables cross-disciplinary collaborators to engage in a structured dialogue where they share their research and practice worldviews. An evidence-based approach, the Toolbox dialogue method has both proximal and distal effects. Proximally, structured dialogue about research assumptions enhances self-awareness and mutual understanding, strengthening the collective epistemic foundation needed for effective collaborative research. Distally, these cognitive effects can increase team cohesion and communication effectiveness by enabling collaborators to avoid both unreasonable agreement and unreasonable disagreement. During this workshop, we will introduce participants to the Toolbox dialogue method and give attendees an opportunity to participate in Toolbox dialogue sessions. These sessions will be structured by a brief Toolbox instrument, which is a survey tool containing Likert items that highlight fundamental differences in research orientation. The workshop will close with a discussion among participants about the experience, focusing on the potential to inflect decision-making on issues relevant to conservation.

INFORMING CONSERVATION AGENDAS THROUGH GLOBAL CONVERSATIONS INTRODUCING THE ECOVILLAGE PLAYING CARDS

Margarita Zethelius, Alliances for Abundance, CASA Colombia, GEN; Jennifer McRuer, UofS, DICE

The Global Ecovillage Network celebrates and honours the wisdom, inspiration and guidance that indigenous and traditional communities around the world have to offer for the design of self-sustaining, resilient human settlements. Many traditional and indigenous communities have asserted that their communities be officially recognised as ecovillages. Motivation is driven by a desire to consciously design their own pathways into the future. We will share examples of such communities from around the world, where biocultural heritage is valued and woven into the four dimensions of sustainability with which ecovillage transition programs engage (i.e., social, culture, ecology and economy). Together, we will experience the Ecovillage Playing Cards: a visual and playful means to design innovative approaches for sustainability, conservation, climate adaptation and mitigation. The educational value of this workshop has critical implications for conservation science approaches and directions that aim to value and learn from diverse knowledge and worldviews in ways that support alternatives to development rooted in biocultural conservation.

INNOVATIVE TOOLS AND APPROACHES FOR ECOSYSTEM RISK ASSESSMENT IN LATIN AMERICA

José Ferrer Paris, Ivic; Irene Zager, Provita

This workshop will foster an open discussion between conservation practitioners, researchers, natural resource managers, and policy makers from Latin America on how to facilitate and improve the exchange of data and information regarding Ecosystem Risk Assessments in the framework of the IUCN Red List of Ecosystems (RLE). Local knowledge is fundamental for assessing many spatial and functional drivers of ecosystem collapse, but human resources and research capabilities (e.g., access to latest technology, reliable internet connection, etc.) is often a limiting factor in Latin American countries. Common concepts and approaches, and a technology transfer mechanism would allow national initiatives to access a common set of protocols, tools and software to develop comparable assessments across borders. The workshop will be led by a moderator, and will provide a limited time for speed presentations from some participants introducing the IUCN RLE categories and criteria, an overview of national RLE experiences completed in Latin America so far, and insights into available tools. The main discussion will focus on the challenges and opportunities of multilateral collaboration between national groups, the need and practical applicability of common tools, and how they can inform and support decision making for ecosystem conservation and sustainable resource management. We expect to conclude with a clear perspective on the essential steps for facilitating the advancement of integrative national and regional initiatives.

INTEGRATING SANCTUARIES INTO NATIONAL CONSERVATION STRATEGIES FOR THE CONSERVATION OF WILD APES

Michel HALBWAX, International Center for Medical Research (CIRMF)

Goal: Move sanctuary and conservation scientists toward a shared perspective on the best practices for the use of sanctuaries in conservation of wild species and work toward a major grant-application to implement such integration. Justification: Conservation biologists and sanctuary scientists often have different mandates and different perspectives on the role of sanctuaries. These two groups likely could benefit from an open dialogue regarding the best way forward to integrate sanctuaries more explicitly into national and international conservation strategies of wild apes, and other species. The purpose of the workshop is to facilitate a two-step coordinated effort: first to apply for a planning grant which, when funded, will then be used to develop a large-grant proposal for launching a major initiative joining sanctuary and conservation scientists in a process to adjust the formal link between sanctuaries and the conservation of wild populations. Format: Ideally this workshop would follow immediately after the proposed symposium entitled: "Thinking outside the sanctuary: Effective and appropriate use of potentially controversial tools to conserve wild ape populations":

- A brief introduction by the facilitator
- A time-limited brainstorm by participants of the steps needed to make forward progress
- An assignment of time-sensitive tasks by willing participants to advance a planning-grant proposal for developing a much larger strategy aimed at integrating sanctuaries into national conservation strategies for great apes and other species."

MAKING ECOLOGICAL METHODS WORK FOR THREATENED AND RARE SPECIES

Christian Devenish, Manchester Metropolitan University; Oscar Laverde, Pontificia Universidad Javeriana; Alex Lees, Manchester Metropolitan University; Huw Lloyd, Manchester Metropolitan University; Stuart Marsden, Manchester Metropolitan University; Renzo Piana, CORBIDI

Rare and threatened species represent a major challenge for quantitative conservation biologists searching for data to feed into conservation management plans and priority setting exercises. Initiatives, such as the IUCN Red List rely heavily on species' abundance and distribution data, and management strategies require detailed knowledge of species-specific natural histories and responses to local and global environmental changes. However, field data are usually costly and logistically difficult to collect. Challenges inherent in collecting data on threatened and rare species include designing statistically robust sampling strategies that permit sufficient records to be obtained; overcoming detection bias; and dealing with demanding physical, political and social conditions. Analysis of data on threatened species must also overcome issues such as inadequate baseline data when comparing the biodiversity values of different landscapes or detecting temporal change in abundance. New technology, novel techniques and interdisciplinary approaches may provide ways to overcome current shortfalls in data availability and knowledge of the ecology of rare species. For example, efforts in the field can be maximised by using automated recording techniques (e.g. microphone arrays, satellite tracking), and formal ecological surveys can be complemented with data from citizen science initiatives, remote sensing and social science methods. This workshop will discuss challenges facing field ecologists working with threatened and rare species, with a view to providing solutions. Specifically, the workshop will ask the following questions:

1. Bottlenecks: What is holding back research in threatened and rare species in each of the priority areas below? Rather than a generic lack of funds, this question is aimed at establishing methodological shortcomings.

2. Solutions: How can we overcome these bottlenecks?"

MILLENNIAL CONSERVATION: HOW TODAY'S YOUTH WILL SHAPE TOMORROW'S CONSERVATION

Leo Douglas, Columbia University, New York City; Tracy Bain, International Fund for Animal Welfare; Kelvin Alie, International Fund for Animal Welfare

The international conservation community acknowledges the importance of engaging a diverse constituency for improved conservation outcomes. We are working to harness the opportunities and benefits of facilitating the inclusion of a broader diversity of millennial-aged youth in conservation research, practice, advocacy, and management. Further inclusion of youth of diverse backgrounds offers unique opportunities to bridge cultural barriers, harness non-traditional ways of communication and meaning-making, mobilize new creativity for positive conservation outcomes, and advance conservation's knowledge-base. This workshop will look at the challenges and opportunities facing millennial conservationists and the unique strategies that appeal to them or that they are utilizing to shape the future of conservation. This workshop invites key findings presentations in the following areas:

1. The contribution of youth to effective conservation advocacy and policy in different socio-ecological settings.

2. The role and responses of youth in conservation behavior change programs and strategies, including work that unpacks assumptions and ethics of these issues.

3. Opportunities for better use of emerging technologies to engage youth in conservation.

4. How youth conceive and address conservation challenges in their generation and in different regions of the world.

We will further facilitate audience participation through a panel discussion that will explore the themes presented and look at how non-profit organizations, multi-lateral environmental agreements, governments, academia and others can further engage youth in their conservation planning, decision making, and project execution. Results from the workshop will inform youth-targeted programs by conservation organizations, including the International Fund for Animal Welfare (IFAW), the Conservation Leadership in the Caribbean (CLiC) Fellowship Program, and the Division of International Conservation - USFWS.

NEW FRONTIERS IN PRODUCTIVE LAND MANAGEMENT FOR CONSERVATION IN TROPICAL LANDSCAPES

Sofia Lopez, University of Queensland; Diego Correa Gomez, PhD student University of Queensland; Rachel Friedman, University of Queensland

Increased global demands for food and fuel are expected to drive further degradation of native ecosystems, biodiversity losses and alteration of ecosystem functions.

The understanding of the interactions between commodity production and conservation of biodiversity is fundamental in order to develop efficient management strategies that maximize socio-economic and environmental benefits. In fact, the conservation of native ecosystems within agricultural landscapes faces several challenges, which include an inadequate resource allowance for biodiversity management, fluctuating governance strategies, and mismatches between opportunity costs between production and conservation of ecosystems and its associated benefits. This session acknowledges both the challenges and the opportunities for the allocation of different commodities in the landscape while maintaining ecosystem diversity and functions. The workshop will bring together research scientists and conservation practitioners that use interdisciplinary strategies to manage heterogeneous landscapes, bringing the opportunity to discuss around different approaches for land-use planning based on a study case in a tropical agroecosystem. We plan to: 1) Introduce a case study in a tropical landscape where multiple stakeholder objectives coexist (15 min), 2) Facilitate a discussion for optimal planning solutions at a landscape scale (30 min), 3) Finalize with a summary of potential strategies to reach an optimal multi-objective solution (15 min).

PREDATION RISK MODELING AS A DECISION-MAKING TOOL FOR REDUCING HUMAN-WILDLIFE CONFLICT

Jennifer Miller, University of California Berkeley

A major challenge in wildlife conservation globally is identifying priority human-wildlife conflict sites where mitigation efforts will be most effective. Spatial risk modeling recently emerged as a tool for understanding, predicting and mapping hotspots of human-wildlife conflict, such as livestock depredation, crop raiding and attacks on people. This workshop will present the methods and applications of spatial risk modeling as a decision-making tool for informing the implementation of conflict mitigation techniques. Spatial risk models developed over the past decade out of the concepts of predator-prey interactions and resource selection functions (RSFs) in order to make predictions about the likelihood of interactions between wildlife (typically large carnivores and herbivores) and humans (or their livestock and agricultural crops). Such models aim to bring a quantitative perspective to help identify the drivers and factors associated with human-wildlife conflict and make inferences about where future conflicts may occur. Spatial risk models produce statistics about which landscape covariates are associated with conflict incidences as well as hotspot maps representing the distribution of risk. Both these products can assist conservation practitioners in deciding where to most effectively implement mitigation methods such as guard animals and reinforced livestock enclosures. Through examining several case studies of risk modeling projects that impacted on-the-ground conservation in Asia, Africa and Latin America, this workshop will teach participants how to build meaningful risk models, as well as how to apply model results to improve decision-making for conservation at the stakeholder, manager and policy levels. Finally, we will explore scope for future research in spatial risk modeling for human-wildlife conflict as well as other conservation topics, such as wildlife trade and disease spread."

PROTECTED AREA DOWNGRADING, AND DEGAZETTEMENT (PADDD): SCIENCE AND POLICY IMPLICATIONS

Rachel Golden Kroner, George Mason University; Carly Cook, Monash University; Siyu Qin, Conservation International; Shalynn Pack, Round River Conservation Studies; Michael Mascia, Conservation International

Though conservation policy assumes that national parks and other protected areas are permanent fixtures on the landscape, research reveals widespread protected area downgrading, downsizing, and degazettement (PADDD). PADDD is driven by industrial-scale resource extraction and development, as well as local land pressures and land claims, with links to accelerated forest loss, fragmentation, and carbon emissions. Despite its potential to jeopardize local, national, and international conservation progress, scientific understanding of and policy responses to PADDD are limited. To catalyze policy-relevant PADDD research and science-based policies, we propose a participatory workshop to assess the current state of PADDD research and policy and articulate a vision for the future. This workshop will empower participants with the latest PADDD research (to foster evidence-based conservation efforts) while charting the future of a critical area of conservation science and policy. It will fill a key gap within the conservation sector by articulating a collective agenda for the future of PADDD research and policy. The workshop will build capacity among several dozen participants and identify specific priorities for PADDD research and policy engagement. These catalytic outputs will foster awareness and understanding of PADDD; greater investment in PADDD research and policy responses; and the emergence of evidence-based policies governing PADDD (e.g. within the Convention on Biological Diversity). To achieve these outputs and outcomes, this workshop will include a presentation and focus groups. The presentation will ensure that participants are aware of the latest research on PADDD while focus groups will enable participants

to identify critical areas for future research and policy guidelines. Together with interested participants, session organizers will then develop this agenda for PADDD research and policy into a manuscript and guidance for the conservation sector.

RACE, CLASS, GENDER AND CONSERVATION

ICCB 2017 Diversity, Equity and Inclusion Committee; Brigitte Baptiste (Instituto von Humboldt); Cynthia Malone, University of Toronto, PhD student

We care deeply about our environment - we also want to be accountable, to make a difference, and to be catalysts for a movement in which equity, diversity, and inclusion are the norm–not the exception. We all have painfully observed that when diversity is not valued, life is diminished. There is a necessity of difficult dialogues about diversity, inclusion, and equity in conservation, and we eagerly want to open the conversation. There is also a need to create safe spaces in communities and organizations where we can have those discussions and think collectively about constructive next steps. There is an awareness that dialogue alone is not enough. Cultural norms need to shift. New leadership must be developed. Power must be shared. The current civil unrest rooted in racism, bigotry, and other social injustices around the world shows how urgent it is to create a more diverse conservation movement (Bonta el al 2015). This plenary on race, class, gender, and conservation addresses the need for equity, diversity and inclusion in conservation (practice and study), challenges within the field of conservation biology for equity, diversity and inclusion, and the role of the individual in this process.

RELIGION AND CONSERVATION: A PLACE FOR COLLABORATION

ICCB 2017 Diversity, Equity and Inclusion Committee; Sister Mary David Walgenback, Benedictine Monastery of Holy Wisdom

Religion and environment, and the interaction between the two, is a recognized and researched academic subject at universities around the world. Secular organizations are increasingly recognizing the need to work with non-¬traditional partners. There is an acknowledgement of the importance of connecting to what really motivates people to protect their environment in order to create successful environmental programs. Conservation goals are not being achieved at the necessary scale to address the escalating global environmental threats. Conservation success depends upon changing human values and behavior, and religions often shape people's identity, values, and conduct. This has led to an increased awareness of the vital role of civil society in driving changes, and religion is the largest sector of civil society in every country. Religion-¬based strategies to environmental issues are often effective and sustainable. This plenary will focus on the relationship between religious doctrines of stewardship for land and nature and conservation biology. How can conservation biologists increase their work with various religious groups? How can conservation biologists and religious leaders work together while respecting their different opinions? What lessons about land stewardship can conservation biology gain from various religious doctrines?

ROLE OF CETACEANS IN ECOSYSTEM FUNCTIONING: DEFINING CONSERVATION POLICIES IN THE 21ST CENTURY

Barbara Galletti Vernazzani, Centro de Conservacion Cetacea; Elsa Cabrera, Centro de Conservación Cetacea; Roxana Schteinbarg, Instituto de Conservación de Ballenas; Sue Fisher, Animal Welfare Institute; DJ Schubert, Animal Welfare Institute; Joe Roman, conservation biologist and researcher at the Gund Institute for Ecological Economics at the University of Vermont and a Hrdy Visiting Fellow at Harvard University; Sue Fisher, lawyer and consultant on marine issues for the Animal Welfare Institute

The workshop "Role of cetaceans to ecosystem functioning: defining conservation policies in the 21st century" is aimed to enhance discussion on this emerging topic and discuss approaches to integrate it in decision making processes related to the conservation and management of these species at national, regional and international level. Increasing scientific evidence shows that cetacean species, and in particular large whales, enhance marine productivity by fertilizing ocean waters with iron-rich feaces and other micronutrients. They also represent an important repository for carbon and their carcasses contribute to biodiversity in the ocean floor. However, the conservation and management of whales continues to be decided under the restricted vision of "just a marine resource" and these scientific findings are still being ignored in the decision-making processes of almost every forum and organization related to the conservation and management of these species. The workshop will have four 10-min presentations by recognized experts in the fields of whales and marine productivity, whales as carbon sinkers and providers of wildlife habitat, ecological economics and whale diplomacy in the 21st century. The presentations will be followed by a 20 minutes round table to exchange views and collect input on ways forward to integrate this emerging issue in the conservation of cetaceans."

SHARING LESSONS FROM IMPACT EVALUATION OF COMMODITITES CERTIFICATION SCHEMES IN SOUTHERN CHILE

Irina Montenegro, WWF Chile; Priscila Molina, WWF Chile

Chile is the world's second largest producer of farmed salmon and one of the largest producers of pulp and wood chips for paper manufacturing worldwide. Unfortunately to maintain the market demand of these commodities, unsustainable environmental and social practices from industry sector have become on main threats to the biodiversity and neighboring communities to forestry plantations and salmon concessions in Southern Chile. As a contribution to mitigate ecological footprint derived from salmon and pulp & wood production, WWF Chile adopted two strategies in 2011 aimed at promoting sustainable practices from on ASC (Aquaculture Stewardship Council) and FSC (Forest Stewardship Council) certifications. After 5 years of implementation, WWF Chile started a project to evaluate social and environmental impacts of ASC / FSC certification adoption in Southern Chile. This interactive session will introduce you to key lessons learned from the first two years of WWF experience on impact evaluation. It will include an overview of basic concepts on certification schemes and a deeper dive into more complex topics about enabling conditions to develop robust monitoring and impact evaluation at strategic level, all grounded in updated thinking based on real-world application. The workshop will cover theoretical concepts and group discussion with examples about main challenges and opportunities to design social and environmental methods for impact evaluation at landscape scale. The workshop will have a capacity of maximum 25 people and we will encourage you to bring your experience, critical thinking and creativity to propose solutions to this thematic.

STARTING AND SUPPORTING LOCAL CHAPTERS WITHIN SCB

Andrew Gregory, Bowling Green State University; Rebecca Mccaffery, United States Geological Survey

Local SCB chapters provide an important grassroots role in the global society. They engage in local conservation action, education programs, and policy efforts. Local chapters can be student-based organizations tied to a university, or broader networks of student and professional conservation biologists and practitioners from academia, government, and NGO sectors. In this workshop, we will provide assistance to members interested in starting a new SCB chapter, and support to existing chapters wanting to connect to other chapters and to the chapters' committee. For people wanting to start a new chapter, global SCB chapter committee members will explain the process of how to establish a local SCB chapter and the advantages doing so. They will to provide hands-on assistance as well as the materials necessary to establish a chapter. For chapters that are already established, this workshop will provide the opportunity for support and networking with chapter committee leadership and other chapter leaders. By the end of the workshop, participants will be on their way to starting a new chapter, and existing chapter leaders will have questions answered and new connections forged with other chapters.

TELLING CONSERVATION STORIES THROUGH ART-SCIENCE COLLABORATIONS

John Fanshawe, Birdlife International, Cambridge Conservation Initiative; Luciana Leite, Oregon State University

Conservation biology has radically increased scientific understanding of the natural world and the impacts modern society has on species and ecosystems globally. Despite these advances, communicating the conservation crisis to the public is still a critical challenge. In recent years, the environmental movement has lost public support, and issues such as climate change and the endangered species act have become politicized, polarized and partisan. In the new, so-called post-truth society, researchers, and practitioners are waking up to the sober reality that facts and figures alone are not enough to change the unsustainable behavior of many individuals and societies. Collaborating with artists and their creative thinking is a crucial new frontier for conservation. From Bosch to Banksy, artists have questioned the status quo, and opened up new ways of looking at nature. In all cultures, art has helped us understand where we come from, who we are, and where we are going. Many argue culture is nature, certainly culture is rooted in nature and, in our globalized society, pictures, films, theater, and music, can have the impact of a thousand words in a thousand languages. Art can galvanize new audiences and drive effective conservation campaigns, both locally and globally. In this workshop, we will explore how art is driving social change. An introduction to the topic will be offered. Afterwards, presenters and participants will elaborate together on how we can facilitate genuine interdisciplinary practice, enabling scientists and artists to learn from one another, and shape new approaches that engage people's hearts as well as their minds. No technical skills are needed to participate in this workshop. We envisage between 15 and 30 participants, but no one will be turned away. We believe that only by creating passionate and positive coalitions of the like-minded, we can create imaginative, and sustainable conservation outcomes."

THE ART OF LEARNING: INTEGRATING DANCE IN SCIENCE EDUCATION

Jame McCray, Dance Exchange; University of Florida

To sustain life on earth we need to improve understanding about ecological systems, promote discourse, and actionable science. But how do you engage with those who don't consider themselves scientists? Movement-based approaches can open the learner to diverse perspectives, and build connections between previous life experiences and the acquisition of new knowledge. The Dance Exchange, founded by MacArthur genius award winner Liz Lerman, has developed tools to encourage students to think creatively about science. During this workshop, Dance Exchange facilitators will lead participants in group exercises and discuss how to adapt tools for various class sizes and settings. Participants will leave with the knowledge and skills needed to use these movement exercises both in formal academic settings as well as in non-formal settings.

THE ROAD AHEAD: WILDLIFE CONNECTIVITY AROUND LINEAR INFRASTRUCTURE

Evi Paemelaere, Panthera; Dafna Angel, Panthera

Objective: Promoting knowledge of effective mitigation strategies for road impacts on wildlife. Justification: Landscape and population connectivity are central themes in wildlife management; genetic fragmentation accelerates extinction rates. Roads are among the largest threats to wildlife globally through both direct and indirect impacts. By 2050, more than 20 million kilometers are expected to be added to the existing road network in developing countries, where many of these roads will lead into previously inaccessible areas. We cannot ignore the socio-economic importance of this human connectivity factor. At the same time, wildlife connectivity is just as important to maintain healthy living environments. This workshop offers training in understanding potential impacts and solutions for species with different 'road behaviors'. Participants will be able to better identify requirements for practical solutions to consider prior to road construction or during road upgrades for better wildlife population connectivity. Organizational structure: brief presentations by Panthera and the United States Forest Service combined with two interactive exercises for participants:

1. Chart for characterization of species of interest in terms of behavior in response to roads and the resulting requirements for crossing structures;
2. Evaluation of strengths and weaknesses of potential under- and overpasses based on photographs.

THINKING OUTSIDE THE SANCTUARY: EFFECTIVE USE OF CONTROVERSIAL TOOLS TO CONSERVE WILD APES

Jena Hickey, International Gorilla Conservation Programme

Goal: This workshop aims to create a safe space for an exchange of ideas on the pros and cons of potentially controversial tools – including and beyond sanctuaries – that are used to achieve conservation of wild apes. Conservation and sanctuary scientists will strive to move toward a shared perspective on the best practices for implementing such tools and under what set of conditions these tools are warranted. Justification: Conservation and sanctuary scientists likely could benefit from a dialogue regarding the positives and negatives of various approaches aimed at conserving wild populations. While best practice guidelines exist for some of these tools, there is still a need to better harmonize the approaches of animal-welfare and wildlife-conservation practitioners. The more we acknowledge and address the various viewpoints regarding the role of novel approaches in conservation, the more we hope to attenuate the controversy and increase the utility of each tool. Ideally the subject workshop would be scheduled the day before the accepted workshop entitled: "Towards a framework for integrating sanctuaries into national and international conservation strategies for the conservation of wild apes and other species. Format: introduction followed by a round table for participants (scientists with direct experience will be in attendance) to share their perspectives on the following topics:

- Reintroductions/translocations
- In situ veterinary care of wild apes
- Vaccinations
- Use of telemetry
- Roles of sanctuaries in conserving wild populations
- Tasks identified and assigned to identify action items and research projects"

TOOLS FOR FOSTERING INCLUSIVE CONSERVATION SCIENCE COMMUNICATION

Cynthia Malone, University of Toronto, PhD student; Rae Wynn-Grant, Center for Biodiversity and Conservation, American Museum of Natural History

How and where we communicate our science, from research journals to social media, can have strong implications for diversity, equity, and inclusivity in conservation science. In this workshop, we will delve into these implications and learn tools for framing and disseminating conservation research in ways that foster

inclusivity. We will work from a community framework that encourages participants to deeply consider diverse constituencies within their institutions, field sites, and wherever else their research has meaning and impact. This conservation community framework will make visible those who exist at the periphery of scientific research and, not incidentally, tend to occupy more marginalized positions in society. Moving forward with an expansive and nuanced understanding of their audience, participants will have the opportunity to explore how their own identities and relationships to power and privilege can shape implicit biases that show up when communicating science. This activity will inform both participant-wide and individually tailored strategies for effective and inclusive communication. We will conclude with a discussion of how these strategies can be taken a step further to cultivate active allyship with groups historically under-represented in conservation science. Throughout the workshop, participants will be encouraged to leverage the global nature of ICCB to learn collaboratively from each other at the intersection of varied geographical and socio-political contexts.

TRAINING CONSERVATION LEADERS: LESSONS FOR ACADEMIC PROFESSIONAL EDUCATION IN ADAPTIVE MANAGEMENT

Armando Valdes-Velasquez, Foundations of Success; Ashleigh Baker, Foundations of Success; Adriana Bravo, American Museum of Natural History, Center for Biodiversity & Conservation; Catherine Christen, SCBI; Arlyne Johnson, Foundations of Success; Ana Porzecanski, American Museum Natural History; Vinaya Swaminathan, Foundations of Success

Conservation projects are implemented in an ever-changing and complex context. To address these challenges, practitioners must apply various approaches and innovations, systematically evaluate their effectiveness, and apply learning to future interventions. How can we better prepare conservation practitioners to design, monitor, and evaluate conservation projects – do good adaptive management (AM) – to effectively address interdisciplinary and complex conservation problems? One solution is delivering academic training via applied conservation programs to generate cadres of conservationists trained in AM skills. This workshop will provide both an opportunity to learn about different approaches to teaching and training in AM, and to share your own questions, strategies, and resources. Workshop leaders will briefly demonstrate an activity to model an adaptive management situation, and share their experiences in developing academic trainings and using a diversity of materials via speed presentations. Participants will then work in groups to discuss these experiences and lessons, and contribute their questions and resources. All resources will be added in real-time to a shared virtual folder for instant compilation and access.

TRANSBOUNDARY CONSERVATION IN LATIN AMERICA AND THE CARIBBEAN: FROM SEGMENTATION TO SYNERGY

Olivier Chassot Labastrou, Society for Conservation Biology; Anthony Giordano, Texas Tech University; Nigel Noriega (Sustainable Innovation Initiatives); Tsitsi McPherson (SCB-LACA); Rurik List (Universidad Autonoma Metropolitana); Karla Pelz Serrano (Universidad Autónoma Metropolitana Lerma); Sandra Pompa (Mansilla, Fuego Verde S.C.); Eduardo Ponce Guevara (Instituto de Ecología); Ana Porzecanski (American Museum Natural History); Valeria Towns (UNAM)

Evidence of changes in the historical patterns of species distribution and phenology is increasing. Expansion of the human environment through urbanization and its associated infrastructure and other anthropogenic factors such as biogeochemical contamination and armed conflict have further compromised diversity and ecosystem resilience. The result has been an increase in population isolation that can reduce the capacity of species to adapt to subsequent environmental change. With such drastic and widespread changes, the coordination of conservation efforts across political boundaries is critical to increase the resilience of species and ecosystems. Throughout Latin America and the Caribbean, there is a need to devise coordinated, socially-resilient, network-based approaches to stem or reverse the loss of biodiversity across connected ecosystems. The main objective of the workshop is to share experiences about collaboration across borders and at regional levels in Latin America and the Caribbean, in order to develop more effective approaches to common conservation challenges. Two outcomes of the workshop will be: 1) the design of solutions for connectivity conservation across borders in the Caribbean, Central America, Amazon basin, Guyana Shield and Southern cone; 2) and the development of collaborative experiences for researchers working on ecosystem and landscape scale conservation in Latin America and the Caribbean.

USING CONSERVATION EVIDENCE TO INFORM PRACTICAL DECISION MAKING

Claire Wordley, University of Cambridge

Justification: Conservation actions are not always informed by the best possible evidence, meaning sub-optimal management choices may be made. This is due to a variety of reasons, including paywalls in scientific journals,

lack of time for managers to find and read scientific papers, and a preference in some quarters for relying on personal experience. The Conservation Evidence project (www.conservationeviedence.com) aims to make it easier for managers to make evidence-informed decisions by collating concise, clear summaries of scientific evidence on management options in one place. In this workshop we aim to explore how Conservation Evidence can be used to support decision making. Purpose: The overall goal is to increase the awareness of the resources provided by Conservation Evidence, demonstrate that using scientific evidence does not need to come at the expense of local knowledge, and to explore how Conservation Evidence can be used to support decision making. This workshop is aimed more at practitioners working to make conservation decisions in management or policy than at academics.

WHAT EDITORS AND REVIEWERS ARE (NOT) EXPECTING TO FIND IN YOUR SUBMISSION

Moreno Di Marco, The University of Queensland; Mark Burgman, The University of Melbourne

Publications are the mean through which research findings and ideas are disseminated to the broad scientific community. Publications are one of the products that scientists in most fields are expected to deliver during and/or after their PhD project. Conservation Science is no exception: publications are one of the things your next employer will look for while screening your CV! Preparing the submission of a paper can be a stress-demanding exercise, and getting the paper accepted can take anywhere between 2 months and 2 years. Despite some cumbersome efforts, young authors sometimes fail to adequately present potentially good papers; as a result, they end up getting their work rejected with negative reviews (or before being sent for review). This generates even more stress of course. The purpose of this workshop is to uncover some of the most common mistakes that make editors and reviewers unhappy, these include both the omission of important information and the inclusion of undesired content. A roundtable of conservation scientists, directly involved in editorial and peer review activities, will provide their personal perspectives on the topic. The roundtable panel will include representatives of the entire decision chain: Reviewer - Editor - Editor in Chief. An open discussion session will follow, where workshop facilitators will encourage participants to interact with the speakers through Q/A, and to share their view and personal experiences. This workshop is targeted to students and early career researchers, especially those without an extensive publication experience. However, scientists with more extensive experience have also found this workshop useful in a previous edition. The ideal group size is around 50 participants, but more can be accommodated.

YOUTH ADVOCATES AND INDIGENOUS KNOWLEDGE: ADDRESSING CRITICAL CONSERVATION CHALLENGES

Michael Chizhov, Volunteer Program, Grand Canyon Trust; Daisy Purdy, Applied Indigenous Studies, Northern Arizona University

Justification: In the face of global political changes, applying key results of conservation biology will become ever more important and difficult necessitating progressive and holistic methods. Youth advocacy and Indigenous knowledge offer unique insights and strategies for supporting and enhancing current scientific approaches. Intergenerational and diverse perspectives are imperative. Synopsis: Workshop facilitators will combine their experience working at a conservation NGO and a public university to provide an interactive session focusing on critical conservation challenges in the Southwestern United States. Participants will have the opportunity to collectively identify common global issues relevant to their work and will explore examples of successful models applicable in various contexts. Attendees will discuss their individual areas of expertise in small working groups with facilitators helping to identify ways in which intergenerational and Indigenous thinking can be integrated into their work. Goal: Highlight global conservation issues that are of concern to diverse participants and identify comprehensive ways to incorporate youth advocacy and Indigenous perspectives into that work.

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