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Talk and Speed Talk Abstracts

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Landowner Preferences for Payments for Environmental Services in Costa Rica

Payments for Environmental Services (PES) are part of a suite of market-based conservation mechanisms that are gaining international attention for their potential to produce ecosystem services across private landholdings. The Costa Rican government, a PES pioneer, provides landowners with remuneration for conserving forest cover. The efficacy and efficiency of PES programs have been critiqued based on two central arguments – (1) PES may be paying to protect forest cover on abandoned land (and as a consequence are not economically efficient), and (2) through targeting economic exchange values PES may undermine other values critical for sustainability. I use data from landowner interviews and an economic nonmarket valuation technique known as the stated choice experiment to explore the impact of PES on private land use decisions in the mixed-use Bellbird Biological Corridor of Costa Rica. The choice experiment is used to assess landowner values associated with a particular environmental benefit. The landowner interviews provide context for the choice experiment results and illuminate the implications for policy. My results indicate that landowners in the study area are resistant to the PES program and view it as a tool designed to benefit large-scale landholders who are not producing on their land. This indicates that PES in Costa Rica are currently not economically efficient. The preferences for land uses as indicated by the choice experiment and interview data suggest that conservation funds would be better directed toward programs that preserve landowner autonomy while strengthening sustainable agricultural systems.

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Exploring illegal hunting motivations in Golestan National Park, Iran

Illegal hunting in Golestan National Park (GNP: the eldest National Park of Iran in Golestan Province) assumed to be the major threat for its largest carnivore-Persian Leopard- and its entire ecosystem. The goal of this study has been to explore the major incentives that drive illegal local hunters to majorly hunt the herbivores of this national park. The methodology used for this study has been an informal qualitative one. 15 local hunters who were from 8 different villages adjacent to the border of GNP were interviewed in depth. The results indicated 5 major reasons behind the hunting activities that are taking place in this national park: 1. Pleasure of hunting/love of hunting, 2. Poverty/to fulfill survival needs, 3. Hunting as a tradition/habit, 4. Hunting for the meat market/trade and 5. Hunting for revenge/conflict with the conservation regulations and bodies. The methodology of this study does not allow for any ordinal results but the in-depth interviews made it apparent that multiple factors such as social, economical and most importantly policies and approaches that the Department of Environment adapt affect what drives them to hunt. In conclusion for GNP local illegal hunters there is always a range of reasons to drive them to hunt, but the dominant reasons are heavily dependent on socioeconomic situations and also the approach that the Department of Environment chooses to interact with the local communities; to either involve them in the conservation activities or to impose non-participatory approaches.

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Carnivore statuses across urban-forest gradients along refuge habitats on ROW's in NY

The large spatial requirements of most predators can provide important insight about how overlooked landscapes such as utility Right of Ways (ROW) can be managed to provide important corridors and conservation areas that facilitate movement between fragmented habitats in developed areas. We assessed the usage intensity of 7 northeast large and medium carnivores by establishing 18 infrared triggered camera stations for ~1 year (January – December 2015) for a total trap effort of 6,120 trap nights across a 76.36 km^2 study area. Study area comprised of 24 mi. of utility ROW encompassing three treatment types and a 0.6 mi. buffer area on each side of the ROW for the same 24 miles across 3 treatment types within the lower Hudson valley, NY. Treatment types are representative of a gradient in development intensity and were compared to a control plot. Preliminary data analysis from 553 unique captures indicate ~279% more carnivore usage on the utility ROW against natural/developed habitat matrix buffer area for all treatments. Utility ROW also appear to harbor increased carnivore species richness. Trap success data will be compared to quantified development intensity around each camera station derived from 2011 USGS Land Cover data set, distance to nearest forest/urban interface, and non-fragmented habitats size using Geographic Information System (GIS). Data from this study will serve as baseline evidence to inform future habitat management actions utilizing ROW's as viable conservation areas.

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Inferring genetic diversity of threatened slow loris populations in Vietnam

Slow lorises (genus *Nycticebus*), which are strepsirrhine primates, have an unique evolutionary history. Five species of slow lorises are currently recognized worldwide, of which two, i. e., Bengal slow loris (*N. bengalensis*) and pygmy slow loris (*N. pygmaeus*), live in Vietnam. Both species are currently threatened with extinction, especially Bengal slow loris (*N. bengalensis*), mainly due to excessive hunting. It is therefore important to evaluate their genetic diversity to better design a conservation plan for these endangered species. In this study, we analyzed 60 samples, including museum specimens and samples collected from living animals from Vietnam, and sequenced three mitochondrial genes: cytochrome b (cyt-b), NADH dehydrogenase subunit 4 (ND4) and cytochrome c oxidase subunit 1 (CO_1) to infer phylogenetic relationships, and assess genetic diversity of *N. bengalensis* and *N. pygmaeus* in Vietnam using the Bayesian Inference and Maximum Parsimony. Our results supported their distribution in Vietnam and revealed clear genetic divergence between populations of *N. pygmaeus* from northern and southern Vietnam. Furthermore, the obtained phylogeny indicated genetic differentiation within populations in the north. Regardless its geographical isolation, we found there is no distinction of *N. bengalensis* populations in mainland to those in island. By comparing sequences originated from Vietnam with those from neighbouring countries, we initially determined the relationships between populations of slow loris in our country with others from Laos, Myanmar, and Thailand.

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Effect of protected area management on socioeconomic conditions of forest communities

Forest-dependent communities in the tropics typically rank lower in socioeconomic status compared to agricultural and urban communities. Protecting the remaining forests for their ecological function and increasing the livelihood choices of forest dependent communities is a difficult task. Management strategies for community forestry have been developed, but most studies find that such programs provide benefits to only a small portion of the targeted communities and often focus on profitable species that do not restore ecosystem function. Additional conflicts can arise from protected area management that targets biodiversity conservation but may restrict resource access to forest dependent communities. In this study, we investigate how actual land use, land use planning, and protected area management affects communities in and around a major forest reserve in the Negros Island in the Philippines. We conduct a large-scale socioeconomic analysis at the provincial level using secondary data derived from government statistics. At a more local scale, we compare the socioeconomic status of communities close to a protected forest with more distant communities to see what costs or benefits are associated with being next to a protected area. Community level analysis shows that resources are more abundant in areas close to protected areas where population densities are low. While rural communities have fewer amenities and infrastructure than urban centers in general, we find that those communities close to a protected forest where non-destructive activities are allowed are better-off than other rural communities farther from protected areas.

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The biology, ecology and control of *Callirhytis ceropteroides*

Black oak, *Quercus velutina*, is the dominant deciduous tree on Cape Cod and Martha's Vineyard. In recent years, oaks on Cape Cod have experienced severe canopy loss due to the infestation of the black oak gall wasp, Callirhytis ceropteroides. Little is known about the lifecycle of *C. ceropteroides* and the taxonomy of the species is still unclear. Our research aimed to investigate the lifecycle of C. ceropteroides, specifically emergence patterns and stages of development. We also evaluated the genetic diversity of *C. ceropteroides* and looked for native predators in other populations that may be possible biological controls agents on Cape Cod. Using the CO_1 gene, we determined that C. ceropteroides is the same invariant species that also infests black oaks on Long Island and Rhode Island. We compared gall wasp population densities on Cape Cod and Long Island and our results showed that the density of *C. ceropteroides* on Long Island was significantly lower than that on Cape Cod, an indication that something is keeping its population in check. We found that both areas have the same parasitoid, *Sycophilla* spp. and Long Island has an additional parasitoid, Acaenacis tacti. In addition, our phylogenetic analysis using Cynipidae sequences from the BOLD database yielded three unidentified specimens that have less than 2% amino acid variation from our specimens, an indication that they are the same species. Our research will lay the foundation for future biological control efforts and will help arborists and landowners make management decisions regarding *C. ceropteroides* on Cape Cod.

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Resource selection, connectivity, & genetics of large carnivores in Southern Mexico

Mexico's Isthmus of Tehuantepec is a critical bridge between Central and North American populations of jaguar (*Panthera onca*) and puma (*Puma concolor*) and also contain remnant populations of the reclusive Baird's tapir (*Tapirus bardii*). The objective of our study is to develop species-specific landscape connectivity models as tools for conservation in the Uxpanapa valley of Veracruz, Mexico. We used noninvasive faecal samples, collected with the aid of detection dogs, to identify species location, individual multi-locus genotypes, and endocrine measures. We surveyed the Uxpanapa valley in the spring of 2010, and 2011 collecting 126 putative felid scat samples and 24 tapir samples. Of the putative felid samples, 56 samples yielded DNA of sufficient quality for species identification based on mtDNA sequences of the ATP6 locus (28 jaguar, 8 puma, and 20 other smaller felid species). We developed resource selection probability functions (RSPF) from these confirmed scat locations. We used the RSPF output to parameterize habitat connectivity models, which we then compared with nuclear microsatellite genetic data and endocrine measures to assess which structural connectivity model was the best predictor of functional connectivity.

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Climate change impact on habitat range and genetic diversity of *L. rhynchopetalum*

Climate change may result in range shift, habitat loss and genetic depletion, severely so in specialized high-mountain species with narrow ecological niches. Here we address the consequences of climate warming for the enigmatic tropical alpine giant rosette plants using the Ethiopian endemic *Lobelia rhynchopetalum* as a model. It is currently widespread but confined to the alpine habitat and extends to the highest mountain peaks. We modelled the habitat suitability of *L. rhynchopetalum* and assessed how its habitat range responds to two climate models and four emission scenarios, using three algorithms with different statistical properties at two different complexity levels. We also analysed its genetic diversity in terms of AFLPs (amplified fragment length polymorphisms) and assessed the impact of range loss. Under both models and all scenarios and consistent across algorithms and complexity levels, this afro-alpine flagship species faces massive range reduction, with only 3.4% of its habitat remaining suitable with high certainty by 2080. We estimated that this will result in an average loss of 15% of its current genetic diversity. The little habitat that remained suitable under future warmer climate was further fragmented into three different mountain systems, decreasing the probability of long-term sustainability of viable populations. We conclude that specialized high-alpine giant rosette plants such as *L. rhynchopetalum* are likely to face high risk of extinction following climate change.

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Conserving evolutionary, functional, and species diversity in Madagascar

Measuring biodiversity is crucial for conservation action due to unparalleled habitat loss and species extirpations. Species, evolutionary and functional diversity are key components of biodiversity related to ecosystem stability and productivity. How can these measures of diversity be used to prioritize areas for conservation? I quantified the diversity of the most endangered mammalian group, the lemurs of Madagascar, in 50 protected areas (PAs). I generated species richness and habitat variables for each PA by creating a geographic information systems database of species distributions, PAs, and habitat variables. I used remotely-sensed climate, topographic, and plant productivity data to model diversity and determine which variables are related to the highest diversity. I used a complete phylogeny of lemurs and a new database of species functional traits to quantify phylogenetic (mean nearest taxon distance) and functional (Rao's quadratic entropy) community diversity. Species richness was strongly positively related to phylogenetic (β=0.47, $p<0.001$) and functional diversity (β=0.05, $p<0.001$), but in PAs with the highest species richness, some species were phylogenetically and functionally redundant. The strongest predictor of all diversity metrics was dry-season plant productivity, suggesting environmental

filters limit diversity in low productivity PAs. Therefore, the highest priorities for conservation are PAs in eastern Madagascar with the highest productivity. The correlation is imperfect, however, and several PAs in western seasonal climates stand out with high diversity and should be considered top priorities (e. g., Tsingy de Bemaraha). Conservation action is necessary as hunting and habitat loss continue to threaten the diversity of lemur communities.

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The 'damning' impacts of small dams

The growth of small hydro-power projects (SHPs) is being widely encouraged as they are believed to be environmentally sustainable and socially equitable. Easy policies, carbon credits and government sponsored monetary incentives have led to the mushrooming of SHPs along most tropical rivers. Our study conducted between December, 2013 and September, 2014 assessed the social and ecological impacts of a cluster of SHPs in the biodiversity hotspot of the Western Ghats. Ecological impacts were studied with respect to forest fragmentation, weed spread, canopy cover, riverine connectivity, freshwater fish assemblages and water parameters. Social surveys were conducted to understand impacts on SHPs on socio-economic activities, resource access and human-animal conflict. Ecological impacts were found to be substantial. Four SHPs having a cumulative capacity of 45MW led to a direct loss of 14.5ha of forest land. Resultant loss in canopy cover and spread of invasive plant species was quantified. More than 10% of the river stretch was left de-watered due to the dams. Freshwater fish species richness, abundance and catch-per-unit-effort were found to be significantly higher in un-dammed sites as compared to dammed sites. Socially, SHPs were not as beneficial as they are believed to be. Respondents claimed that human-elephant conflict began only after SHP construction began. This relationship was examined with secondary data, and found to be true. Our study is the first to document an increase in human-elephant conflict due to small dams. In light of our findings, we suggest that the policy regarding SHPs in biodiversity-rich areas be revised.

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Conservation genetics of the Scarlet Macaw in Costa Rica

Currently, the members of the Psittacidae family around the world face two human-induced threats: habitat loss and illegal pet trade. Despite being the macaw with the largest geographical distribution in the Neotropics, the scarlet macaw Ara macao is also affected by these threats. For example, after inhabiting all lowlands of both versants in Costa Rica, this species' range was reduced to just two major populations, separating them geographically: one in the Central Pacific and the other in the Southern Pacific region. In both sites, nest poaching is an ever-present activity. This investigation intended to assess the degree of genetic variation within these populations and to examine the genetic structure and differentiation among them. Moreover, these populations were tested for evidence of past bottleneck events. For this purpose, feather and fecal samples served as DNA source and DNA genotyping based on Polymerase Chain Reaction amplification of nine microsatellite markers followed. Overall, genetic variability of wild scarlet macaws was moderately high, although both populations departed from the Hardy-Weinberg Equilibrium. This was manifested through heterozygote deficit in both populations, probably due to them being geographically separated (Wahlund effect). This separation is beginning to exhibit significant differentiation and genetic structure, yet there was no evidence of past bottleneck events. Conservation measures that may be applied to scarlet macaw populations point out the need to connect isolated populations in order to maintain high genetic variability and prevent further differentiation. In addition, resource allocation should focus on habitat restoration and poaching prevention.

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Exploring the effects of climate change on caribou management in Western Canada

Although considerable research was undertaken on individual threats to caribou in Canada, less is known about the cumulative impacts of human activities. Moreover, understanding of how stressors may be exacerbated by anticipated climate change is virtually nonexistent. We used downscaled climate projections and a regression tree technique to model expected climate and vegetation changes in West Canada and Alaska over the next century. We then explored present and future threats to caribou conservation by comparing the projected changes in the fundamental (climate and soil only)

and realized (adding vegetation and road density) niches of Northern and Southern Mountain, Boreal, Barren-ground and Grants populations. Consistent with other studies, our predictions show a considerable redistribution of ecosystems through expansion of broadleaf into current needleleaf forest, concomitant with expansion of temperate ecosystems northward and into higher elevations. Caribou projections suggest there may be limited opportunities for some populations to track their niches northward or upslope. With significant shifts in caribou distribution expected, we identified few potential climate "refugia" for populations, inferring that impact on caribou habitat and range distribution could be severe. A significant shift in management strategies is needed, including the identification of areas to facilitate caribou climate adaptation in land-use planning.

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Abundance, habitat and conservation threats of the endangered River dolphins in Nepal

Conservation of the last remaining Ganges River dolphins (*Platanista gangetica gangetica*) in Nepal relies on robust population estimates and better information on suitable habitat characteristics. To gain a better understanding of these parameters, we conducted boat based surveys in the three major river systems (Karnali, Sapta Koshi, and Narayani) of Nepal. We recorded covariates at high spatial resolution and utilized these data to inform occurrence and abundance models. We accounted for detection bias by applying occupancy and N-mixture models for imperfect and heterogeneous detection. Occupancy results indicate that dolphin site use varies among the different river systems, across two seasons, and increases with river depth. River effects received nearly 100% of the model support and had the strongest influence on dolphin occurrence and abundance. The seasonal influence on dolphin occurrence in the systems ($\Sigma\omega i = 0.998$) revealed that occupancy probabilities were heightened during the pre-monsoon season. Deep pool habitat was also identified as a predictor of dolphin habitat use, which accounted for 41.02% of all dolphin sightings occurring in this habitat. Although estimates vary depending on season, we estimate that there are between 37-42 (95% CI28-52) Ganges river dolphins distributed in the rivers of Nepal. Results suggest that seasonality and each specific river affect dolphins and their habitat in Nepal; we strongly recommend site and season-specific conservation actions. Further research in the integration of additional and alternative abundance techniques, behavioral studies, and pursuit of a conservation genetics approach are all important steps in the management of this endangered species.

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Spatio-temporal variation in target species diversity in Baja California Sur, Mexico

Both theory and empirical work have demonstrated that diverse ecological assemblages can contribute to resilience, allowing social-ecological systems (SESs) to persist in spite of environmental variability and change. In the context of fisheries SESs, Worm and colleagues (2009, Science) found that fisheries with more diverse catches were more resilient to over-exploitation. A diversity of target species can also expand fishers' opportunities and contribute to adaptive capacity. Here we report on analyses of historical catch data from Mexico's National Commission of Aquaculture and Fisheries for Baja California Sur. We investigate the spatial and temporal dynamics of reported landings from 10 fishing offices from 2001 to 2013 to address: How does the richness and composition of reported landings vary through space and time? We find that taxon richness of reported landings is highly variable among the fishing offices and composition of these fished assemblages varies geographically. Fishing offices on the Pacific coast of Baja California Sur experience a larger variance in taxon richness, and have significantly lower diversity of landings than those on the Gulf of California coast. Taxon richness increased significantly over the 13-year time frame for two of the 10 offices (both on the Pacific coast); these changes are responsible for a statewide increase in taxon richness from 2001 to 2013. Placing these trends in the context of regional oceanographic and demographic variability will enable us to develop a more mechanistic understanding of if and how target species diversity is contributing to resilience of BCS' fisheries and fishers.

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Ecotourism and the demographic dynamics of oceanic blacktip sharks

The oceanic blacktip shark (*Carcharhinus limbatus*) is one of many shark species that have experienced rapid population declines in recent decades. We studied its demographic dynamics in Aliwal Shoal, a South African marine protected area (MPA) where over 2,000 tourists dive with sharks annually, luring them in with food. As larger sharks often outcompete smaller ones for this food, we expected them to be more likely to forgo migration and stay in the MPA across seasons. Larger females also have more offspring, and so Aliwal Shoal may be serving as a refuge for these reproductively important individuals. We accompanied tourists on diving excursions, taking photographs for time/location data on individually identifiable sharks and body length measurements using photogrammetry. We also started a citizen science initiative, greatly bolstering our data. Our results show that similar numbers of sharks in each size class were present across seasons, providing tentative evidence that the ecotourism is not affecting size-class-specific migration. Our study also provides other valuable information for conserving this species. We corroborated previous suppositions that females are reproductively mature at 1.5m in precaudal length by observing growth in wild sharks. Repeatedly measured individuals showed rapid growth rates between size classes but slow growth once sharks reached 1.5m, indicating an energetic shift from growth to reproduction. Conservation efforts could thus focus on females that are at least 1.5m long to promote population growth. In addition, we used a new method of identifying individual sharks and the database amassed will facilitate future population monitoring.

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Carnivore mortality risk at multiple scales

Understanding the impact of human activities in shaping source-sink dynamics across landscapes is of critical importance in practical applications of ecology. The American black bear (*Ursus americanus*) is a large-bodied carnivore often involved in human-carnivore conflict across North America. In the Western Great Basin, human-induced mortality to black bears is frequent, with up to 60 incidents per year. Analyses of mortality risk are frequently used to demonstrate the relationship between human land use and source-sink dynamics in wildlife populations. These analyses, however, are typically carried out with anthropogenic landscape variables at coarse spatial scales, thus failing to uncover the complexities of human influence on natural systems. We were interested in testing the impact of spatial and temporal scale on predictions of mortality risk for black bears in the Western Great Basin. We used locations and descriptions of human-induced mortality to black bears from 1997-present along with nine environmental and anthropogenic landscape variables of biological importance to large carnivores to construct generalized linear mixed models indicating probability of black bear mortality across the Western Great Basin. Analyzing mortality risk using parameters at fine spatial and temporal scales suggest that many anthropogenic metrics were equal or stronger predictors of mortality risk than those uncovered by coarse analyses. Results suggest risk of human-induced mortality to carnivores should be measured at multiple scales to ensure accuracy, and support the advancement of risk map efforts that use multi-scale anthropogenic parameters in shared human-carnivore landscapes.

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Genetic diversity of the leopard, *Panthera pardus*, in Sub-Saharan Africa

The leopard, *Panthera pardus*, has the widest habitat tolerance and range of any felid spanning across Sub-Saharan Africa, the Middle East, and extends into Eastern and Southeastern Asia. While leopards remain relatively abundant and widespread, anthropogenic pressures have resulted in an approximate 37% contraction of their range in Africa, which has fragmented several formerly connected populations. Continental-scale biogeography studies have found ecologically and evolutionary significant diversity in wide-ranging wildlife across Africa. Using a combination of fecal samples and archival specimens from the American Museum of Natural History, I seek to explore the relationship between Africa's unique biogeography and the genetic diversity of leopards within Africa. Currently, all leopards within Africa are recognized as a single subspecies (*P. p. pardus*). Variation within target mitochondrial gene regions could identify substantial variation within the African leopard and warrant further classification of leopards within Africa. This work aims to identify if there is significant genetic variation present within leopards of Sub-Saharan Africa and how these molecular data correspond with geography.

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Footprint Identification Technology (FIT) in Eastern Mountain Bongo Conservation

The Eastern Mountain Bongo (*Tragelaphus eurycerus isaaci*) is listed as critically endangered by the IUCN with approximately 100-150 individuals left in the wild. Monitoring and assessing the health of the remaining wild populations is an important part of current and future initiatives in the conservation of this species. However, wild bongos are elusive and live in steep, densely forested habitats, making them difficult to track. Commonly used tracking methods, such as radio collaring and GPS chipping, can be costly and invasive, often detrimental to the health of the animal. Footprint Identification Technology (FIT) is an algorithm program developed by WildTrack that identifies footprints by the species, age and gender levels. It has been proven as a cost effective, non-invasive and highly successful tracking method for lions, rhinos, bears, tigers and other species. Using the photographs of captive bongos at zoos in the United States and reserves in Kenya, we are developing an algorithm that will enable rangers, citizens and conservationists to take photographs of wild bongo prints, which will then be identified as individuals in a population. The result will be a more comprehensive and cost-effective assessment of the health and make-up of these remaining populations in the wild, allowing for more successful conservation outcomes.

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Puma resource selection and implications for risk in San Guillermo National Park

I am investigating puma (*Puma concolor*) resource selection in the dry puna ecosystem of San Guillermo National Park, Argentina. Between spring 2014 and spring 2015, GPS clusters generated by collared pumas (n=7) were searched in the field and vicuña (*Vicugna vicugna*) density was estimated using the strip transect method. Puma location data, observed kills, and vicuña density data will be used to model puma resource selection in the context of spatial-temporal variation and prey (vicuña) availability. San Guillermo is essentially a one predator-one prey system, with open plains lacking both forage and cover sharply contrasted by canyons and meadows offering ample forage and abundant cover. Previous research on puma diet and vicuña mortality within the park suggests a potentially strong trophic interaction mediated by puma predation risk, but this has yet to be explored further. A deeper understanding of puma predation and potential risk effects in this system will shed broader light on predator-induced trophic cascades, a phenomenon of special significance to large carnivore conservation. Virtually devoid of human activity, San Guillermo is the most intact remaining example of puna ecosystem, making it an ideal ecological baseline for a region threatened by mining and agriculture.

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Ecological niche differentiation in the Nile crocodile species complex

The niche of an organism is defined by fundamental attributes of the species' natural history including its behavioral, physiological, and reproductive ecologies. These characteristics arise in response to both phylogenetic inertia and contemporary selective forces. Among closely related taxa, it is predicted that niche conservatism should result in poorly differentiated niche space. However, among more distantly related species, the converse should be true. We tested the idea

that despite broad historic sympatry, the newly re-discovered Sacred crocodile (*Crocodylus suchus*), exists in a divergent niche space than the congeneric Nile crocodile (*C. niloticus*), that is more closely related to non-African members of Crocodylus. Our ecological niche models for both species indicate that significantly different bioclimatic factors influence each species' model and that the niche of *C. suchus* is significantly more constrained than that of *C. niloticus*. The niche divergence observed among these taxa and their previously unrecognized phylogenetic distance support theories of niche evolution. In addition, published field observations of both species support our model's predictions and suggest that *C. suchus* is much more vulnerable to local extirpation than *C. niloticus*. We argue that niche differences between the two species provide additional support and urgency for the formal recognition of *C. suchus* as proposed by Hekkala & Shirley et al. (2011).

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ESU definition to establish better strategies for conservation threatened species

The goal of conservation genetics is to understand the spatial distribution of the genetic variation of endangered species in order to take the best decision for their preservation. Phylogeography is a discipline which infers the evolutionary history of populations and species; and it thus provides information for identifying the evolutionary significant units (ESU), i. e. the groups of populations that constitute units for conservation. In our study, we focus on a species whose lowland populations are rare and threatened: the large flowered sandwort (*Arenaria grandiflora*). This species comprises many ecotypes in widely separated areas of Western Europe. Its taxonomic status is still in discussion. To define the potential ESUs of this species, we first quantified the genomic size of individuals from natural populations. By using approach of FCM (Flow Cytometry) which facilitates rapid screening of various ploidy levels in those populations. We then assessed the neutral genetic variation of the same natural populations using 13 nuclear microsatellite loci which can be explained by polyploidy. We also have undertaken the study of the variation of chloroplast DNA (cpDNA) fragments to definite the maternal lineages. In addition, polyploidy has played a significant role in the evolution of vascular plants, so we will germinate seeds for counting chromosomes. Whereas this knowledge of ploidy level provides a reliable criterion for taxa determination in numerous taxonomically intricate populations of Arenaria grandiflora The aim of these types of genetic analyses is to develop the best conservation programs for the endangered populations of the species.

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On community-based conservation in Madagascar: impact and mechanisms

Madagascar's notoriously high level of biodiversity is currently threaten by deforestation. Local communities have been increasingly involved in conservation policies over the last 20 years. What has been the environmental impact of this approach? In this paper, I quantitatively analyze the impact of community-based conservation policies (co-managed Protected Areas and community forests) and explore the mechanisms leading to this impact. I use annual fine scale remote sensing data of forest cover for the period 2000-12, an exhaustive spatial dataset of protected areas and community forests at the national scale, and socio-economic data. To control for confounding factors, I mix matching and regressions statistical models. I find that co-managed PAs have allowed to slightly decrease deforestation while the direct delegation of forests to communities has so far failed to decrease deforestation. I then explore the socio-economic determinants of this limited effectivness in five study sites, with a particular emphasize on collective action. I combine household surveys and experimental games to find a general low involvment of households in environmental actions as a cause of limited environmental impact. This weak collective action seems more a problem of a limited concern for conservation issues rather than a complete incapacity between villagers to cooperate (measured by trust). The difficult process of changing mentalities hence appears as crucial to improve the effectiveness of community-based conservation in Madagascar.

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Closing the gap: assessing gender dynamics in UN REDD Programme projects in Sri Lanka

Poor women are consistently marginalized members of society. In forest communities, women are heavily dependent on forest resources, yet have the least access to decision making processes. As a result, outsiders, such as aid workers, often overlook women in development projects (Chambers 1983). The Center for International Forestry Research's (CIFOR) initiative on Forests and Gender states, "The neglect of gender in the realm of forestry remains a serious limitation to forestry institutions' abilities to conduct research and advice on policy matters related to global emerging issues." CIFOR,

along with other researchers (Osmani 2008; McDougall et al. 2013), uses a gaps framework to discuss gender inequity in landscape management. Aid organizations attempt to close gaps through capacity building and community organizing. Many conferences exist in which organizations share best practices for closing the gender gap. This study offers an innovative look at knowledge translation, or knowledge flow from conference to the field (Rademacher 2011), in an effort to study organizational efficacy. Participant observation of WOCAN's Regional Dialogue on Women's Inclusion of Landscape Management was conucted and a follow up survey distributed. Additionally, a case study of one of the conference participants, UN REDD Programme in Sri Lanka, will be discussed. Through interviews with conference organizers, UN employees and local communities engaged in REDD projects, as well as participant observation at the project, the study offers fresh insight into the importance of conferences, how knowledge is translated from conference to field, and how women work to be included in landscape management.

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Improving conservation via spatio-temporal analyses: carnivore ecology, Madagascar

The ability to identify high-risk locations for threatened species across a landscape is vital for developing and implementing effective management plans. Identifying these high-risk locations results, in part, from our understanding of spatial and temporal interactions among species. An understanding of these interactions is particularly important as human encroachment and native-exotic wildlife interactions increase globally. Exotic carnivores present a serious threat as they negatively influence and/or interact with native wildlife via exploitative competition, interference competition, intraguild predation, and/or transmission of pathogens. Studies investigating species interactions fail to include both a spatial and temporal component which is likely to lead to improper inference. We present a widely-applicable, novel approach to investigate interactions between species across both time and space. We combine both spatial (single-species and two species occupancy analyses) and temporal (kernel density estimation) analyses to demonstrate the spatial exclusion of the native spotted fanaloka *Fossa fossana* by the exotic Indian civet *Viverricula indica* across Madagascar's eastern rainforest ecosystem. We found a strong decrease (>40%) in occupancy for spotted fanaloka and high temporal overlap at sites where Indian civet were present, resulting in a strong lack of co-occurrence (SIF < 1.0) across time and space at patchy, degraded forest sites. This novel modeling approach allows us to identify more accurately the precise locations where co-occurring species are interacting (measured in spatio-temporal overlap), including where threatened species are at most risk, thus greatly improving our ability to develop targeted, effective management plans to conserve threatened species worldwide.

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Distributional estimates for *Bassaricyon neblina* (Olinguito) in the Northern Andes

Due to anthropogenic disturbances and ongoing climate change, cloud forest ecosystems are vulnerable, making the study of endemic species in these areas particularly important. Bassaricyon neblina, the olinguito, is a newly discovered mammal of the family Procyonidae, found within cloud forests of the Western and Central Andes of Colombia and Ecuador. In this study, we utilized ecological niche models (ENMs) to estimate climatic suitability for B. neblina, subsequently processing that prediction with MODIS forest cover data and protected area maps. Models were built using spatially filtered occurrence data (museum records and citizen-science photographs), bioclimatic variables, and the Maxent algorithm. We trained and tested models using a cross-validation approach, and tuned optimal settings. The resulting prediction was clipped using a deforestation tolerance threshold determined by forest cover values at recent localities. Preliminary results indicate roughly 80,700 km2 of climatically suitable area for B. neblina, which is only moderately tolerant of deforestation. Suitably forested areas for this species are highly fragmented by deforestation, with 48% of the climatically suitable area being sufficiently forested. The largest areas of this remaining suitable habitat occur in the northernmost portions of the Western and Central Cordilleras in Colombia, southwestern Colombia, and northern Ecuador. Furthermore, only an estimated 26% of areas suitable both climatically and in forest cover are currently protected by national parks or private reserves. In subsequent stages of this research, we will reassess the IUCN Red List status recommendations for this species and estimate the impacts of potential future climate change.

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Understanding the impacts of climate change on population connectivity

Species can cope with changing climates by colonizing new territories, but their ability to do so depends upon their dispersal capabilities. For marine species in particular, patterns of dispersal remain poorly understood, including how these patterns change through time to allow or constrain climate-driven shifts in species distributions. For economically important species, like summer flounder, it is crucial to understand dispersal and the role of shifting climate on population size and distribution so that these knowledges can be incorporated into management strategies. Due to its popularity, overfishing of summer flounder (*Paralichthys dentatus*) resulted in a steep population decline in the late 1980s to early 1990s, marked fishing restrictions, and conservation measures to improve stock abundance. Today, the summer flounder stock has been successfully rebuilt, but is managed as a single population with state allocations based off of the population distribution in the 1980s. With genetic material from long-term collections of larval summer flounder (n = 428) and recently caught adult specimens (n = 306) along the U. S. East Coast, we are using double digest RAD sequencing to determine the degree of larval connectivity and historical movement of genotypes as sea surface temperatures have warmed over the past 26 years. As part of a larger collaborative project, the connectivity matrix from our genetic analysis is being replicated using otoliths from the same individual larvae. Both connectivity matrices will be used to develop population and economic models that will benefit fisheries managers, summer flounder and the fishermen who depend upon them.

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Effects of grazing management on vegetation and soils: a comparison across continents

Grasslands and other rangelands cover more than 40% of the earth's land surface and their current major use across the globe is for domestic livestock grazing, a practice that has largely replaced natural co-evolved grazing systems. Recently, increasing populations and more sedentary lifestyles of pastoralists, accompanied by increases in livestock numbers, have led to apparent overgrazing and degradation of rangelands. One proposed action to halt or reverse this degradation is through the practice of holistic, or planned, grazing management. However, consensus on the success of this type of grazing management compared to more traditional strategies has yet to be reached. Grazing management strategies may differ in several ways: through variation in a pasture's stocking rate (density of animals allowed to graze in an area), in the frequency (or seasonality) of rotation of pastures utilized for grazing, or in some combination of the two. This variation in spatial and temporal patterns of grazing may have differing consequences for biomass production, plant species composition and diversity, and ultimately, the sequestration of organic carbon in the soil. Using a series of camera traps and exclosure cages to estimate grazer impact, and vegetation surveys and soil analyses to measure vegetation and soil quality, this study will compare various traditional and planned grazing management strategies across two types of semi-arid/sub-humid grazing systems: the temperate, C3 grassland steppe of Patagonia, characterized by warm, dry summers and wet winters and the tropical, C4 grassland of northern Kenya, characterized by a bimodal rainfall pattern and consistent warm temperatures.

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Use of interview data on a regional scale to identify correlates of jaguar occupancy

My current research involves the habitat use of felids in human-impacted landscapes. Much of my work is associated with the Jaguar Corridor Initiative (JCI), an initiative led by the conservation organization Panthera to conserve jaguars (*Panthera onca*) across their range, from northern Mexico to northern Argentina. I am currently analyzing data on jaguar presence, prey abundance, and historical distribution trends from 3,587 interviews with local people across 13 jaguar corridors in Central America. Four to six interviews were collected in grids of 16-36 km^2, depending on estimated home range size of jaguars in the region, for a total study area of over 50,000 km^2. The first phase of my analysis will be using a single-season occupancy framework to model jaguar habitat use as a function of ecological (e. g. wild prey abundance, forest cover) and anthropogenic (e. g. human population density) covariates. The second phase will consist of using multi-season occupancy models to model contraction of jaguar presence as a function of historic forest loss. Our modeling results will be used to identify (1) main drivers of jaguar habitat use across their Central American range, and (2) high-priority areas for the

conservation of this threatened species. Such an analysis will be the first attempt at using interview data with local people to assess species habitat use and range contraction on a multi-country scale.

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Long term natural regeneration of holm oak woodlands after agriculture abandonment

In the beginning of the 19th century the typical forest ecosystems, the holm oak woodlands, of south Portugal suffered an intense logging due to crop intensification. Holm oaks are the key specie of this ecosystems and determinant in a climate change scenario, however due to the slow growth and the high mortality rates in the first years is a major concern at long term level. Here we studied the influence of microclimate in the potential natural regeneration of holm oak woodlands at landscape level and along the time in one hilly site that was completely cleared of forest at 60 years ago. Using potential solar radiation (PSR) as surrogate of microclimate and old aerial photography we modelled the natural regeneration of holm oak cover a long time and space. We found contrast differences in the natural regeneration speed within higher and lower PSR values. After 60 years the higher PSR slopes had just 20% of holm oak cover, whether for less PSR slopes it was 90%. Places exposed to higher PSR could need more than 60 years to reach 10% of tree cover, only with assistance Holm oak woodlands will grow in less time. This findings are useful for conservation programmes that want to recover the natural forest of this regions, only with active forestation in the highest PSR values we would be able to have a woodland in shorter time.

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Identifying cryptic lineages within an endemic frog genus in the Western Ghats, India

A large number of species in the tropics are awaiting discovery, many due to their crypticity i.e. lack of morphological difference. The Western Ghats is a unique biological hotspot with a number of ancient lineages that act as good model systems to test for crypticity. We tested for crypticity in a frog genus, Indirana, endemic to the Western Ghats of peninsular India. Till 2009, Indirana included 10 recognized species, but recent studies suggest an underestimation of the true diversity. Given the backdrop of these studies, we used a larger spatial and taxon sampling and tested for crypticity in Indirana explicitly using phylogenetic divergence and morphology. We updated a published phylogeny using increased taxon and spatial sampling, and by examining the relationship between genetic and morphological divergence among close relatives. Initially, we delimited potential lineages using a 16S rRNA haplotype tree and then applied, multiple criteria including haplotype clusters in a multi-gene tree, genetic distances and geographical range separation. We then examined pairs of potential lineages with differing levels of genetic divergence in multivariate morphological space. Our results suggest that there are 19–21 potential lineages in Indirana, which is an increase of 70–90% from earlier estimates. Several lineages within Indirana were cryptic and could not be distinguished on the basis of morphology, and the potential lineages identified await formal description as species.

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Linking diversity to function in wood-rot fungal communities

Microbial communities are critical regulators of the global carbon cycle and the climate system through decomposition of organic matter. Temperature is known to have a strong direct positive effect on decomposition rates, and rising temperatures resulting from climate change are generally expected to increase decomposition. However, the indirect effects of temperature on decomposition rates via changes in community structure are not well understood. Using wood-rot fungal communities collected from red oak logs in Connecticut as a study system, we used a full factorial design to explore whether changes in temperature may indirectly influence decomposition rates via changes in community structure. Original fungal communities were collected from the field and colonized sterile red oak discs for 90 days at 15°C, 20°C, or 25°C. The colonized discs then decomposed sterile red oak blocks at either 15°C, 20°C, or 25°C for 90 days. Percent mass loss of the sterile block was calculated to determine decomposition rates. Decomposition rates were largely driven by the reigning temperature during the decomposition incubation period. However, original incubation temperature was also a highly

significant predictor of percent mass loss. Our findings demonstrate a significant "legacy effect" of temperature change on the function of decomposer communities: decomposition rates at 20°C were significantly higher for samples that were originally incubated at 25°C than for those that were originally incubated at 15°C. Our results suggest that as atmospheric temperatures rise, decomposition rates of organic matter may increase due to both direct and indirect (community-mediated) effects of warming.

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Crisis restoration: ecosystem service scarcity drives local Andean forest transitions

Andean forests were cleared at a rate of 1% per year in the past decade, mainly for farming. But forests also returned in some locales, producing 'forest transitions'—net increases in forest cover. Seen as a silver-bullet solution to conserve biodiversity and provide residents with the ecosystem services that sustain small-scale farming, the drivers of local transitions are still little studied. I examine forest cover change in Intag, an Andean 'biodiversity hotspot' where people are planting trees to restore cloud forest. Do communities reforest and deforest simultaneously? Which households reforest, why, and how do they benefit? Remote sensing shows that prior to reforestation projects, deforestation rates in Intag were extremely high (>3%/year). During reforestation, forest cover increased by 3%—a local forest transition. However, although deforestation rates slowed precipitously (<2%/year), people continued clearing biodiverse primary forests in the highlands even as they reforested farms and communities. Household interviews and oral histories point to a new 'path' by which forest transitions occur – the ecosystem scarcity path – in which local demand for forest ecosystem services drive forest recovery. Because people continued to clear biodiverse primary forests, species continued to be lost. However, replanted areas also contained far more tree species than unplanted, abandoned pastures. Communities experiencing environmental crisis may be most in need of, and thus willing to participate in, local tree-planting efforts. Ecologically, these degraded environments are also most in need of restoring—a win-win for forests and people in heavily cleared regions throughout the tropics.