American Museum of Natural History

Center for Biodiversity and Conservation

Student Conference on Conservation Science - New York

Talk and Speed Talk Abstracts

October 9-12, 2012

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Plant diversity and vulnerability analysis of philippine indigenous upland ecosystems

This study provides an integrated vulnerability assessment of the traditional land-use systems of indigenous communities living at the lowland-to-upland environs of Mt. Halcon, a critical protected area in the island-province of Oriental Mindoro, Philippines. With the limited studies in Asia that analyze potential impacts of climate change on marginal sector, this study explores the utility of Principal Component Analysis and canonical correspondence analysis in understanding the socio-economic and biophysical determinants of vulnerability—defined as a function of exposure, sensitivity and adaptive capacity, while also aiming at providing empirical bases for specific policy options for adaptation. It is shown that degree of vulnerability is differentiated between and among the commonly perceived homogenous indigenous communities. With the projected increase of weather extremes such as typhoons and droughts in the coming years, the value of traditional peoples' vast yet untapped indigenous knowledge systems (IKS) is indispensible in explaining their seemingly inherent high adaptive capacity. Central to this are the utilization of plant resources derived from their maintained agro-ecosystems totaling to about 130 species of about 1,255 individuals belonging to a total of 44 families and are providing various services such as food, medicine, infrastructure, weaving and adornments purposes. In contrast to implementing purely externally determined adaptation programs, there is a need to capitalize on indigenous peoples' knowledge systems particularly on plant resources to reduce their vulnerability to weather extremes and other hazards related to climate change.

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Landscape features influencing livestock depredation in the maasai steppe

The African lion has declined precipitously across its entire range from nearly 500,000 in the early 1900s to roughly 35,000 individuals today. While a multitude of factors contributes to the lions' decline, conflict with traditional pastoralists is one of its gravest threats. Lions, hyenas and leopards opportunistically prey on livestock including cattle, goats, and sheep in pastoral regimes. However, lions are disproportionately blamed for livestock depredation and are common targets in retaliatory killings. Several NGOs including the African People & Wildlife Fund are finding ways to minimize predation incidences and thereby retaliatory killings. Strategies such as corral fortification reduce predation events at the home. However, roughly 50% of attacks are at pasture and using 54 months of carnivore/livestock conflict data in the Maasai Steppe of Tanzania, we assess landscape factors using multivariate analyses in order to characterize the risk of predation at the pasture. By identifying factors contributing to greater predation risk, we hope to suggest strategies to mitigate attacks at pasture. This way, herders have greater capacity to protect their primary source of wealth and continue to co-exist with lions. Preliminary results indicate that proximity to bomas (corrals) is the most relevant landscape feature explaining the likelihood of attack across all three carnivores. After accounting for boma proximity, no other variable contributes a significant explanatory role, and attacks appear random. This implies that environmental characteristics may be less important than social or behavioral variables of the herders in determining livestock predation at pasture.

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Patch selection models evaluate effects of conflict management on wildlife foraging

Human-dominated landscapes offer spatially concentrated and reliable food resources that attract wildlife and lead to human-wildlife conflicts. Conflict management is often directed at humans (e. g., education) to reduce attractants or foraging benefits to wildlife, or at wildlife (e. g., hazing) to increase foraging costs, but strategies can be expensive and ineffective. Because a key driver of conflict is the pursuit of food by wildlife, we used patch selection models, a dynamic, statedependent modeling approach based on foraging theory, to assess how benefit reduction and cost increase resulting from conflict mitigation affect wildlife foraging decisions. We applied the patch selection models to a system in which American black bears (*Ursus americanus*) forage in urban and urban-interface patches and conflicts are common. We used survival as a fitness currency and body fat reserves as a state variable. We incrementally reduced availability of anthropogenic foods (benefit reduction) and increased energetic costs of movement in response to aversive management (cost increase) to search for thresholds resulting in avoidance of human-dominated patches. Benefit reduction ≥ 55% in urban patches and ≥ 60% in urbaninterface patches resulted in avoidance by bears of almost all states. Cost increases

achieving similar results exceeded 1300% and 400% in urban and urban-interface patches respectively, and are likely unrealistic to implement. Given modeling results and that control strategies targeting wildlife are unpopular with constituencies, we suggest allocating management resourcesto strategies that reduce availability of anthropogenic food.

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Ecological value of restored wetlands in the St. Lawrence valley of New York

Wetland restoration is a conservation tool used by government agencies and non-profit organizations to compensate for past and present losses of wetland habitats. There are 2 federal programs that restore wetlands on private property: the U. S. Fish and Wildlife Service Partners for Fish and Wildlife Program (PFWP) and the National Resource Conservation Service Wetlands Reserve Program (WRP). Currently, the largest number of these wetland restorations projects in the nation is found in the St. Lawrence Valley of New York. While PFWP and WRP can be considered successful in terms of area of wetland restored, uncertainties exist regarding the longterm sustainability of these programs. The objective of our research was to assess whether PFWP and WRP restorations are meeting their goals of providing habitat for wetland-dependent species, using animal and plant communities as biological indicators of wetland quality. We have evaluated the species richness and composition of amphibian, bird, fish, reptile, and plant taxa at 34 PFWP and WRP restorations and 16 natural reference sites. Preliminary results indicate no significant difference between animal and plant community metrics between restored and natural wetlands, although average metric values were consistently higher at natural sites. Thus, we conclude that restorations function similar to natural wetlands in providing habitat for wetland-dependent species. We are currently examining how method of restoration, age, and surrounding landscape features (e. g. land-use, wetland connectivity, land cover) affect wetland community structure; this research has direct management implications for wetland restoration policy and practice.

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Differences in elasmobranch assemblages between marine reserves and fished reefs

Our previous research has shown that Caribbean reef sharks (*Carcharhinus perezi*) are significantly more abundant inside marine reserves when compared to similar fished reefs on the Mesoamerican Barrier Reef. We now pose the question: what effect have marine reserves had on the abundance of other elasmobranchs? Rays, including the southern stingray (*Dasyatis americana*), spotted eagle-rays (*Aetobatus narinari*), Caribbean whip-ray (*Himuntura schmardae*) and yellow stingray (*Urobatis jamaicensis*) are not commercially targeted by Belizean fisherman. An appropriate null hypothesis is that marine reserves have no effect on the relative abundance of these species. Baited Remote Underwater Video (BRUV) surveys were conducted on the forereef at four sites along the Belizean barrier reef, at two established marine reserves and two fished reefs (N=50 per site). Of the 100 deployments at the two reserve sites 13 batoids were observed, compared to 58 observed at the two fished sites. We constructed a generalized linear model (GLM) to explain the presence of batoids on BRUVs, which included "marine reserve", "location nested within reserve", habitat characteristics and several environmental variables as potential factors. The GLM found that the factor "marine reserve" had a significant negative effect on the presence of batoids, while none of the habitat or environmental variables had a significant influence ($p>0.002$). We discuss ongoing research aimed at explaining this pattern, including potential mechanisms such as (1) mesopredator release due to reduced predation from reef sharks, (2) altered batoid behavior due to intimidation by sharks inside reserves and (3) increased competition for prey inside reserves.

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Using plant functional traits to refine ecological restoration techniques

Enrichment planting is a commonly used restoration technique to increase species diversity or environmental services during forest regeneration. Our study provides guidance in selecting species for restoration activities, and is among the first to directly link species performance across different environmental conditions to easily measured plant functional traits. We used an experimental approach to test whether species' ecological characteristics influence the ability of seedlings to survive in three successional stages. We transplanted seedlings of six species (three secondary-growth specialists and three old-growth specialists) into old-growth forest, second growth forest, and pasture plots at La Selva Biological Station in Costa Rica. Seedlings of old growth (OG) specialists had lower specific leaf area, and higher leaf dry matter content, leaf thickness, and leaf toughness than secondary-growth (SG) specialists. OG specialists had higher survival rates than SG specialists across

all plot types. Among surviving individuals, relative height growth after 6 months was highest in the pasture, and lowest in old-growth plots (ANOVA, P<0.0001). This difference is attributed to effects of light availability, as the highest light levels occurred in pasture and the lowest levels occurred in old-growth forest (Kruskal-Walis, P<0.001). There was no discernable tradeoff between growth and survival among species. Our results indicate that, across the spectrum of environmental conditions, species with resource conservation traits have higher survival rates than species with fast-resource k traits. Growth rate within and among species is related primarily to light availability. We conclude that selecting old growth specialists for enrichment planting would improve survival rates without sacrificing plant growth rates.

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Genetic analysis of the island loggerhead shrike, *Lanius ludovicianus anthonyi*

Based on limited research, the island loggerhead shrike, *Lanius ludovicianus anthonyi* has been considered a distinct subspecies endemic to the northern California Channel Islands. We used mtDNA control region sequences and microsatellite genotyping to compare loggerhead shrikes from the southern California mainland (*L. l. gambeli*), San Clemente Island (*L. l. mearnsi*), and the northern islands (*L. l. anthonyi*). Habitats on the islands are recovering due to the removal of nonnative ungulates on the islands, but may be transitioning to habitats less supportive of loggerhead shrikes, so this evaluation comes at a critical time. We utilized 96 museum specimens that were collected over a century to evaluate both spatial and temporal genetic patterns. Analysis of multilocus microsatellite genotypes indicated that historical specimens of loggerhead shrikes (collected between 1897 and 1986) from the two northern islands of Santa Rosa and Santa Cruz are genetically distinct from adjacent mainland and island shrikes. Birds from Santa Catalina Island showed mixed ancestry and did not cluster with the northern island birds. Historical specimens of *L. l. mearnsi* from San Clemente Island also showed mixed ancestry. Our study provides evidence that a genetically distinct form of loggerhead shrikes, *L. l. anthonyi*, occurred on the islands of Santa Rosa and Santa Cruz.

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Genetic Structure of Leopards in the Satpura-Maikal Landscape of Central India

Habitat loss and fragmentation can influence the genetic structure of biological populations. Large terrestrial predators can often avoid genetic subdivision due to fragmentation because they have high rates of dispersal-mediated gene flow. Leopards (*Panthera pardus*)are the most widely distributed of the large and middle-sized felids and are considered to be habitat and diet generalists. We investigated the genetic structure of leopards in four populations from five protected areas and inter-connecting corridors spread over an area of 45000 km2 in central India. We identified 217 individual leopards from fecal samples using a panel of seven microsatellite loci. Leopards showed high levels of genetic diversity in all sampled populations. Spatial and nonspatial Bayesian analysis revealed at least two admixed genetic populations, contrary to our hypothesis of panmixia. We identified nine individuals as migrants, most of which were in reserves connected by corridors. Genetic differentiation between populations was not explained by geographic distance, and we did not detect any genetic bottleneck in this population. We conclude that this genetic subdivision is due to habitat fragmentation and that existing corridors help to maintain genetic exchange between protected areas in central India.

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Biodiversity and ecosystem services in changing Ethiopian coffee agroecosystems

Biodiversity and the well-being of tens of millions of people who depend on ecosystem services, in southwest Ethiopian old coffee agroecosystems, are threatened by rapid deforestation and land use changes. The forest fragments in the region are the world's only habitats for genetically diverse wild Arabica coffee populations and highly endemic Ethiopian flora and fauna. Ethiopia is both the birthplace and the fifth largest global producer of Arabica coffee, the second most traded global commodity next to petroleum. To understand fragmentation effects on woody biodiversity in remnant forests and compare to surrounding coffee farms, we explored (1) the effects of fragmentation on woody species diversity, size class distribution, and regeneration using ecological sampling along transects of 18 forest fragments and (2) the relative roles of shade coffee systems in woody biodiversity conservation using similar field studies in smallholder and state coffee farms. Our results

show that smallholder and large-scale coffee farms maintain 59% and 26% of the 155 total recorded native woody species, respectively; 12% of which are restricted to the coffee farms. In addition to planned biodiversity for shade coffee, associated biodiversity such as ferns, epiphytes, insects, birds, and primates are supported in both farms. Smallholder farms have higher diversity and more regenerating species than state coffee plantations. In the face of rapid deforestation and fragmentation coffee farms could play vital role in supporting biodiversity and vital ecosystem services in these landscapes.

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Humpback whale isotope signatures: Population strucuture and management implications

Conservation of marine species requires an understanding of population structure to identify appropriate management units. Discrete populations of humpback whales have been identified through spatial variability in isotopic signatures. Until now, however, temporal isotopic variability of a humpback population has not been considered. In this study, isotopic variability was examined over time at the level of the individual and over time at the level of the population, using 173 skin biopsies collected over an eleven-year period (1999-2010) in the California Current from a single population of humpback whales. Samples were analyzed for carbon and nitrogen stable isotope composition. Isotopic signatures of skin biopsies from 2001-2003 reflected measured carbon and nitrogen values of krill, and were significantly different from 2004-2006 samples which reflected measured isotopic values of schooling fish. The sample time frame coincides with a cool-to-warm phase-shift in the Pacific Decadal Oscillation and an accompanying change in the dominance of prey from krill to schooling fish. The combined isotopic and oceanographic data indicate a probable prey switch in the sampled humpback population. The resulting temporal isotopic variability within this population is greater than the spatial isotopic variability previously observed across all humpback whale populations in the North Pacific. This work suggests that stable isotopes may still be a powerful 2nd line of evidence for detecting demographically distinct populations but short-term snapshots of spatial isotopic variability may be insufficient for creating robust pictures of population structure, especially in long-lived highly migratory species.

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Understanding the dynamics of amphibian populations and its implications for declines

The apparent global decline of amphibian populations has generated a need for effective methods for identifying true declines in abundance from natural fluctuations. Since amphibian populations experience high levels of annual variation in recruitment, understanding long-term population dynamics is essential to separate true declines from natural decreases. Evidence from a 23 year study of a population of Fowler's Toad (*Anaxyrus fowleri*) in Long Point, Ontario, Canada, indicates substantial fluctuations in abundance and evidence of decline over the last 9 years. This decline is coincident with the spread of an invasive marsh plant, the Common Reed (*Phragmites australis*), throughout the toads' breeding sites. Using an information theoretic approach, we compared models of population growth that included both intrinsic (density dependence) and stochastic extrinsic factors (weather), as well as the deterministic factor of P. australis expansion in breeding marshes. From 1989 through 2001, prior to the major expansion of *P. australis* in the study area, population growth of the toads conformed best to a model of Gompertz population regulation and winter severity affecting overwintering mortality. These factors declined in importance over the latter 10 years of the study, 2002-2011, and the variable for growth of *P. australis* explained an increasingly significant degree of the variation in population growth. We interpret this as evidence of habitat loss due to an invasive plant species causing the decline of an amphibian population. Furthermore, we advocate the use of multi-model inference for long-term time-series to identify changes in population dynamics coincident with population decline.

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Indicators and drivers of habitat quality and water quality in inland Michigan lakes

Water quality and habitat quality are important components of lake ecosystems and are controlled by natural and anthropogenic factors operating at multiple spatial scales. Understanding the relative importance of these factors and the scales at which they operate is therefore critical for identifying threats and developing effective lake management

strategies. Through a series of models, I evaluated the factors that influence water quality and habitat quality in 263 inland lakes located throughout Michigan. I defined water quality and habitat quality as latent, conceptual variables indicated by measures of water chemistry, clarity, and lakeshore development. I then developed structural equation models (SEMs) to test hypothesized, causal linkages between natural and anthropogenic drivers of lake water quality and habitat quality. Models were parameterized for multiple combinations of spatial scale and lake hydrologic type. Overall model fit was significant at every combination of scale and lake type and data at the cumulative scale explained the most variation in water quality and habitat quality. The strongest driver of habitat quality was residential development, which occurred preferentially on larger lakes. Residential development also mediated the indirect effects of urbanization and wetland cover. Agricultural land use was the strongest driver of water quality through its indirect effect on forest cover. Modeling results also suggested that the current suite of indicators used by resource agencies are relatively robust measures of water quality and habitat quality. There was no significant correlation between water quality and habitat quality, suggesting these two concepts are fundamentally different components of lake health.

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Reciprocal predation mediates the co-persistence of native and nonnative species

Understanding mechanisms that allow co-persistence of native species with nonnative species may provide important insights on how best to manage highly altered systems. We report a case of reciprocal predation as a likely mechanism to facilitate co-persistence of endangered desert fish, Mohave tui chub (*Siphateles bicolor mohavensis*), with invasive western mosquitofish (*Gambusia affinis*). We established experimental populations (sympatric and allopatric) of tui chub and mosquitofish to evaluate reciprocal trophic interactions between these two fish species. Mosquitofish had a significant negative effect on tui chub recruitment ($W = 142$; $P < 0.01$). Reciprocally, tui chub had a significant negative effect on mosquitofish recruitment ($W = 137.0$; $P < 0.05$). One unexpected outcome was reduced survival of adult mosquitofish in the presence of tui chubs. Allopatric mosquitofish populations were significantly larger (157.2; SE ± 26.9) than mosquitofish populations sympatric with tui chubs (22.1; SE ± 4.0) ($W = 155.0$; $P < 0.001$). These results suggest intraguild predation (IGP) between these two fish species, where tui chubs prey on adult mosquitofish while mosquitofish prey on eggs/ larvae of tui chubs. Thus, IGP is an apparent mechanism facilitating persistence of Mohave tui chub in the presence of non-native western mosquitofish. These findings also provide more management options allowing managers to consider limited habitats currently harboring mosquitofish as possible refuge sites for Mohave tui chub, an option previously un-available. Understanding the complex interactions among native and non-native species in the whole-ecosystem context may help conservation practitioners identify novel management options.

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Tracking and modelling deepwater horizon disaster impact on deep coral communities

In November 2010, we identified 58 potentially impacted deep coral colonies 11 km SW of the Macondo well, three months after it was capped. Most corals at this site were *Paramuricea biscaya*, and showed signs of impact in the form of excess mucous production, tissue damage, or coverage by a brown flocculent hydrocarbon-rich material (floc). Through four revisits over the following year, we tracked the progression of visible impact on individual colonies using high resolution imaging. Impact levels for coral colonies were quantified by digitising the images and determining the proportion showing tissue damage, stress (such as dripping mucous), or coverage by floc. Multiple imputation was also used to model the temporal progression of impact to the site as a whole as well as to provide insights into the eventual fate of the impacted corals. Although some branches showed signs of recovery, many coral branches covered by floc later died and were then colonised by hydroids. The probability of hydroid colonization of the corals is a function of the degree of initial impact. This work expands the known radius of impact to at least 11 km, substantially more than the 3 km stated in some previous reports and provides the first data on longer-term effects of hydrocarbon exposure on deep-water corals.

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What to inventory in a changing world? Izembek National Wildlife Refuge: A case study

Considering the effects of natural and human-induced environmental stressors, especially climate change, on Alaskan ecosystems, it is crucial for the US Fish and Wildlife Service (USFWS) to determine its priorities for regional inventory and monitoring programs. A side project of the Alaskan Inventory and Monitoring Initiative, the goal of this research is to design a prioritization system to help the Izembek National Wildlife Refuge (NWR) directs its efforts in the upcoming inventory program. The focus of this system is on evaluation of the ecosystem types and their biotic/abiotic components, and those environmental stressors which have considerable potential to affect the ecosystems on the refuge. Regarding the conservational needs of the region, the system presented includes not just common or generalist species but also specialist and endangered species. It also identifies informational gaps about the ecosystem types and focuses on the primary environmental stressors affecting the area. We have taken a 'bottom-up approach' for the inventory plan, starting the evaluation with missing information about species diversity, species distribution and abundance, to better understand the trophic interactions and ecological dynamics, and ending with the efficiency and feasibility of the proposed project for the Izembek NWR. The regional objectives are also considered in our system by using the 'bottom-up approach' in a way that informs the regional program about the local ecological nuances and applies the regional objectives at the local level. We believe that the ecosystem/stressor analysis at the refuge level will be beneficial to the regional inventory program of Alaska

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Exotic trees facilitate native forest regeneration on abandoned farmland

Forest cover must be restored on extensive areas of abandoned tropical farmland to conserve biodiversity and ecosystem function. Abandoned farmland often contains remnant exotic trees that previously provided farmers with wood or fruit. Restoration and carbon sequestration projects often require managers to remove these exotic trees, even though they may facilitate native forest restoration by attracting animal seed dispersers or modifying the microclimate. We studied abandoned farmland in Kibale National Park, Uganda to quantify how remnant exotic trees affected regenerating tree species richness and abundance. We searched former farmland abandoned approximately 20 years ago for mature eucalyptus and exotic fruit (avocado and mango) trees. Around each tree, we established a 10 m radius circular plot and paired it with an equal control plot nearby. In each plot, we identified the species, counted the number, and measured the size of tree seedlings. We found a total of 81 tree species naturally regenerating: 70 tree species in fruit and 47 tree species in eucalyptus tree plots, compared to 56 and 44 tree species in fruit and eucalyptus control plots. Fruit and eucalyptus tree plots had more than twice as many tree seedlings as their control plots, many of which are dispersed by mammals and birds. Taken together, our results illustrate how remnant exotic trees can accelerate forest regeneration by attracting animal seed dispersers, and highlights the importance of not removing exotic trees without studying the role they play in forest restoration.

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Herbivore enhancement as a tool for reef restoration

In July 2009, the Hawaii Division of Aquatic Resources designated Kahekili Reef, Maui an Herbivore Fisheries Management Area (HFMA), banning the removal of herbivorous fishes and urchins in an effort to promote herbivore grazing and thus reverse the decline in coral cover on the reef. Land-based nutrient loading and overfishing have likely led to the increase in algal cover and 40% decline in coral cover at Kahekili over the past 15 years. In this study, seasonal algal growth rates, herbivore grazing rates and preferences, and herbivore populations were collected upon designation of the HFMA and in the subsequent two years. These data create a production/consumption budget for the reef to provide management targets. Herbivorous fish and urchin grazing rates indicated clear preferences for different species of macroalgae among herbivores, though the majority of grazing occurs on turf algae. Fishes and urchins graze typical blooming algal species an order of magnitude faster than non-blooming algae and preferentially graze nutrient-enriched algae. These preferences suggest that an increase in herbivore biomass due to protection could be effective in reducing algal abundance, especially for blooming and nutrient-enriched algae. Presently, algal production at KHFMA exceeds the grazing capability of the herbivore community. Therefore, future increase in herbivore biomass will be essential to improving reef health and increasing reef resilience to global stressors. A similar approach to this study could be used to establish management targets for other reefs and the success of the HFMA could provide a model for coral reef management.

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Restoration and reciprocity: Indigenous knowledge in ecological restoration

Traditional ecological knowledge (TEK) of indigenous peoples is increasingly being recognized by scientists and policy makers as a potential source of ideas for emerging models of sustainability, conservation biology, and ecological restoration. TEK has value not only for the wealth of ecological information it contains, but for the cultural framework of respect, reciprocity, and responsibility in which it is embedded. This talk will explore how TEK and the indigenous philosphies of reciprocity might guide the science of sustainability. The indigenous concept of the "honorable harvest" provides a framework for expressing reciprocity between land and people. Ecological restoration is a vital element in the exercise of reciprocity in which humans actively participate in the well-being of the land. Finding common ground between indigenous and scientific principles of restoration can couple the wisdom of TEK and the power of environmental science for shared goals of sustainability.

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"Reaching beyond the choir" and other career lessons from the history of conservatio biology

Conservation biology is a relatively young discipline, making it quite easy to review some of its highlights with a view toward extracting a few insights about how young conservation professionals can be more effective. For example, we have learned that applied science cannot end with publication in scientific journals and talks at professional conferences; wider communication is essential. The importance of striving for creativity and being willing to challenge conventional wisdom is also apparent from a review of conservation biology. Thinking about moving from research to application reveals the need for being willing to take action but without compromising objectivity. Lastly, one cannot overlook personal considerations such as maintaining balance and hope in one's life.

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Mitigation of human-felid conflict in the face of a quickly rising human population

The human population in Sumatra has expanded rapidly resulting in a significant increase in Human-wildlife conflict. To date, mitigation of human-wildlife conflict have generally focused on charasmatic megafauna such as the Sumatran elephant and the Sumatran tiger. Human conflict with smaller species usually goes unreported and is thus assumed to be occurring at low levels. To assess the actual levels of conflict between humans and small felids in Sumatra, we conducted surveys in ten villages surrounding Bukit Barisan Selatan National Park in Southern Sumatra. These surveys indicated that relatively high levels of conflict were occurring with the majority of respondents reporting some loss of livestock to small felid species. Most alarmingly, a high level of retribution killing for livestock depredation was also reported at levels that were likely to negatively affect felid populations in the region. To address this issue, we conducted mitigation and educational initiatives in five of the ten villages initially surveyed. We built chicken coops, reenforced goat pens, and presented basic ecological information on Sumatran wildlife. We then resurveyed all ten of the villages in order to assess the efficacy of our mitigation techniques in reducing human-small felid conflict. Villages in which we had conducted education and mitigation reported a significantly reduced level of depredation by small felids, and exhibited a much more positive view towards Sumatran felids in general. Villages in which there was no mitigation efforts exhibited little change in the level of conflict and in their attitudes towards small felids in general.

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Rangeland conservation and pastoralist resource-use decisions during droughts

During droughts, herders typically move their livestock to areas that maintain water and grazing such as rivers, swamps, and forests, but pastorlist access to these drought resource areas (DRAs) can be inhibited by cultivation and conservation. Loss of access to DRAs may be influencing the resource-use decisions of people living adjacent to world-renowned protected areas, which are coping with considerable anthropogenic environmental changes. The objective of this study is to better understand how these challenges are interrelated. I evaluated the distribution of DRAs in relation to conservation areas in the Kenya/Tanzania border region using satellite imagery. I then analyzed interviews and retrospective survey data from households that vary in proximity to Tarangire National Park in order to elucidate factors that have influenced Maasai resource-use decisions during recent and historical droughts. Geospatial analysis indicates that conservation areas contain

disproportionately high percentages of DRAs. Tarangire encompasses two prominent DRAs, but interviews suggest that before Tarangire was established, Maasai used these DRAs less than previously thought due to resource availability in other areas and concerns about livestock disease. Preliminary decision-modeling indicates that the selection of livestock watering sites consists of two choices that are influenced by different factors: 1) labor and grazing availability affect the choice between local and distant sites; 2) herd size, social capital, location, and cost influence the choice of a particular water source. Small rivers and ephemeral streams are critical DRAs, but broader land use changes appear to be impacting these waterways through alterations in sediment and water supply.

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Modeling dynamic ecosystem processes within and beyond urban conservation boundaries

In an increasingly urbanized world, effective management of natural resources and ecosystem processes requires interdisciplinary approaches that acknowledge the spatiotemporal coupling of human and natural systems at hierarchical scales. There is a critical need for new methodologies and tools that integrate ecological and socioeconomic drivers to predict landscape dynamics under various management and policy alternatives. The Mass Audubon Society's Broadmoor Wildlife Sanctuary is comprised of 850 acres of wetland, meadow, and transitional forest habitats, surrounded by agricultural and low- to medium-density residential communities. This heterogeneous landscape is dynamic, continuously acted on by both human and natural drivers of change (i. e. development and management, succession and ecosystem engineers). The research presented here examines the impact of these drivers within and beyond the boundaries of Broadmoor through two case studies. The first focuses on quantifying the ecological impacts of changes in management goals, specifically the conversion of a non-working orchard to early successional habitat in an effort to maintain declining meadow bird populations. The second study focuses on predicting landscape-scale impacts of growing North American beaver (*Castor canadensis*) populations on human infrastructure within Broadmoor and in neighboring communities. Both case studies utilize a new interdisciplinary modeling approach to conservation management, integrating high- and moderate-resolution remote sensing imagery, multi-temporal GIS data, biological inventories, local natural history, and expert narratives to produce a comprehensive view of human-natural system dynamics at multiple scales over time.

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Natural recovery of tsunami affected littoral forests in Nicobar Islands, India

Indian Ocean tsunami (2004) has severely damaged the littoral habitats that are critical for the survival of many endemic flora and fauna of Nicobar Islands, India. We studied the recovery of littoral forest tree community after the tsunami to develop restoration strategies. The study was carried out in six Islands of the Central Nicobar group of Islands during 2010-2011, where tsunami had wiped-out all the vegetation. Two kinds of regenerating sites were identified namely 1) Sandy regenerating sites (SRS) where substrate was affected by enormous deposition of sand and coral rubbles 2) Sand loamy regenerating sites (SLRS) where the substrate was remained as sand-loamy but the vegetation was destroyed completely. Since 2010, we annually monitored tree vegetation (stems ≥ 10 cm GBH) from six plots (50 x 20 m) each in SRS and SLRS. Six control plots from unaffected forest (UF) were also studied during 2011. The mean number of species, individuals and basal area varied significantly between SRS, SLRS and UF ($p<0.01$). The tree diversity (19.67±9.07/plot) and basal area (73.17±22.42 m2/ha.) were high in UF and stem density (186.67±99.6/plot) was high in SLRS. Among the regeneration sites, mean number of species, individuals, basal area and species accumulation rate were very high in SLRS than SRS. It is inferred that, changes in substrate level can inhibit the colonization rate of plant species. Hence, we recommend that the restoration programs should concentrate on improving the soil condition that could promote the natural colonization of other pioneer and pristine forest species.

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Living on the edge: Wetland ecotones as peak refugia from an introduced predator

The impact of introduced predators on native prey is dependent on their spatiotemporal overlap, which determines the availability of prey refugia. In Lake Nabugabo, Uganda, wetlands serve as hypoxic and structural refugia for native species from introduced predatory Nile perch (*Lates niloticus*). However, hydrological interactions with the main lake may create ecological gradients across the wetlands, and the recent encroachment of native hippo grass (*Vossia cuspidata*) may also have limnological consequences for the refugium. We sampled extensive wetland transects in Lake Nabugabo to examine

spatial trends in ecological conditions and fish community composition. We detected declines in water depth, temperature and dissolved oxygen, and an increase in structure, with distance inshore. Peaks in fish abundance and species richness occurred at the ecotone where the wetland and open water meet. We found that both species richness and diversity were negatively correlated with temperature and structure, and positively correlated with dissolved oxygen. Wetland areas with thicker margins of hippo grass had higher average temperatures, greater structural complexity, and lower dissolved oxygen, and thus supported lower species richness and diversity. These results demonstrate the role of ecological gradients in shaping refuge assemblages, and suggest that continued expansion of hippo grass will reduce refuge availability for native prey.

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Adaptive genetic variability in the marbled murrelet: Implications for conservation

Maintaining adaptive genetic diversity is essential for conserving the ability of species to adapt to rapid environmental anthropogenic change. Genetic diversity in the vertebrate major histocompatibility complex (MHC) is generally believed to be important for conferring resistance to a range of environmental pathogens. We demonstrated that exon 2 of the MHC Class II B gene could be an important source of adaptive genetic diversity in the threatened seabird, the marbled murrelet (*Brachyramphus marmoratus*) based on 60 individuals sampled from California to Alaska. We detected high levels of genetic diversity and evidence of balancing selection in exon 2, as well as evidence of positive selection in putative peptide binding sites (PBS). Moreover, differences in allele frequencies were detected between geographically isolated populations, a finding that differed from previous results for neutral molecular markers. The genetic differences we observed among populations indicate that previously delineated conservation units for marbled murrelets may not reflect geographic variation in adaptive genetic diversity and should be reconsidered. These findings have important implications for the management of marbled murrelets and their old-growth nesting habitat in the Pacific Northwest. More broadly, our results indicate that considering adaptive genetic diversity, in addition to diversity at neutral genetic markers, may be important for delineating conservation units that effectively conserve evolutionary potential.

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Phylogenetic conservation priorities for sharks

Nearly 93% of shark species appear in the International Union for the Conservation of Nature- Red List. Around half of them are listed as Data Deficient (DD) demonstrating our limited knowledge on the biology, ecology and population status of many sharks. This is an urgent problem as sharks are threatened due to overfishing and incidental capture. Here, we provide a first estimate of the evolutionary distinctiveness of shark species and integrated it with estimated probabilities of extinction from IUCN and other sources to generate a phylogenetic conservation priority rank of species. We used a comprehensive species-level phylogeny and estimated parameters for species absent in the phylogeny based on their taxonomy, to include all species in the Red List. We focused especially on species under pressure from commercial fisheries and/or rarely observed(i. e. deep-sea sharks). The nurse shark (*Ginglymostoma cirratum*, DD) was the most evolutionarily distinct species while the lizard catshark (*Schroederichthys aurisqualus*, VU) with unknown population trend, obtained the highest estimate of priority. Within the top 40 species of conservation priority, 15% of species were DD and 50% had unknown population trend. None of the species listed in the top-40 had populations exhibiting an increasing trend. Forty five percent were either deep-sea sharks or commercial important species, and four are commercial important species. In general, there were no differences in evolutionary distinctiveness when comparing sharks by habitat or commercial importance. By integrating evolutionary information of the different shark lineages with their current conservation status we provide additional criteria to guide shark conservation.

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Modern threats to older species: Evolutionary age and extinction risk in mammals

Evolutionary age is hypothesized to correlate with higher probabilities of extinction in vertebrates, in which extinctions and threatened species are concentrated in older lineages in some groups. The characteristics that allowed the prolonged

stasis and survival of older lineages may not enable species to cope with current threats. Lineage age is hypothesized to correlate with traits that influence vulnerability, yet comparative studies of extinction risk rarely consider phylogenetically explicit variables. In this study, we account for these variables by using a species-level, dated mammalian phylogeny and Bayesian inference to model the IUCN Red List categories as an ordinal response. We found no clear global relationship between species' evolutionary ages and their extinction risk. Moreover, there was no global correlation between age and any morphological, life history or ecological traits commonly known to predict risk. Our preliminary findings suggest that some taxa in older lineages are likely to be more threatened because they share slower life histories, higher endemism, and smaller ranges. Others may persist due to geographic isolation, or by having distinctly advantageous generalized or specialized ecologies, behaviors or morphologies. The multiple trends we observed depend on the spatial and taxonomic scales of analysis, underpinned by specific regional history, chance and the spatial distribution of lineages in relation to threats.

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Environmental sustainability in a post-disaster context: Haiti, a case study

The effects of climate change are becoming increasingly severe, thereby increasing the likelihood of natural disasters. Additionally, as global population expands, more people will occupy disasterprone lands; consequently, more people are vulnerable to disasters. Post-disaster recovery understandably focuses first and foremost on saving lives and providing shelter to displaced populations. However, recovery efforts require a significant amount of building materials and nonmaterial inputs. As international agencies' procurement processes involve global sourcing and therefore global impacts, the temporal and spatial aspects of the recovery will likely be global in scope. In order to limit the local and global impacts of post-disaster recovery on the environment – some which can be fatal – sustainability efforts warrant significant consideration. The research will address the following question: How can the principles of environmental sustainability be considered in post-disaster settings without interrupting the humanitarian response? The research examines the 2010 Haiti earthquake recovery, and utilized unstructured interviews, direct observation, grey literature, and quantitative data to 'paint a picture' of the realities facing funders and implementers and how that affects local and global environmental issues. Interviews have been conducted with a wide range of stakeholders (n=35) including funders, implementers, and procurement specialists as well as experts in environmental and disaster response issues. Findings to date have identified root causes of environmental degradation in post-disaster settings and potential programmatic interventions; including, amongst others, enhanced supplychain management strategies, energy use during the mid-term recovery, reconsideration of current transitional shelter practices, and rubble reuse strategies.

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Conservation and genetics of the allen cays rock iguana (*Cyclura cychlura inornata*)

The Allen Cays Rock Iguana (*Cyclura cychlura inornata*) is endemic to the Allen Cays, a small chain of islands in the Bahamas. This iguana is classified as endangered by the International Union for the Conservation of Nature. Naturally occurring populations exist on only two small cays, however, new populations of unknown origin were recently discovered on six additional cays. A restricted range, small population size of approximately 1,000 individuals, and the persistent threat of human disturbance put the species at continued risk. Maintaining genetic diversity is critical to successful conservation strategies and population management, however, despite over thirty years of life history research, little is known about the population genetics of this species. To investigate patterns of genetic variation, we analyzed blood and tissue samples from over 100 individuals. Our data from mitochondrial DNA sequences and nuclear microsatellites outlines the relationships among the populations on different cays and resolves the origin of individuals in the new populations. In addition, this information can be directly utilized to optimize population management strategies. Our genetic analyses will provide the basis for selection of individuals best suited for future iguana reintroduction and translocation projects. For example, an iguana translocation project is currently underway in anticipation of a plan to use rodenticides to eradicate introduced house mice (*Mus musculus*) from the Allen Cays. Our research improves our ability to develop conservation strategies that maximize genetic diversity in order to preserve this endangered species.

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Disappearance of a living fossil: population assessments of Nautilus sp.

Nautiluses are ancient animals whose lineage has persisted in the oceans for 450 million years. During the last 40 years, however, humans have heavily fished nautiluses, causing severe declines to populations. Regulation and management efforts remain absent due to a lack of quantitative data on the impact of fishing. To demonstrate the impact of fishing on Nautilus, an unexploited area in Australia and an area in the Philippines that has been fished for 40 years were selected as study sites. Catch effort data was collected from these two areas and compared to historical anecdotal reports from the Filipino fishermen. In Australia, the catch effort was one Nautilus per one trap while the Philippines' catch effort was one Nautilus per 13 traps. The historical catch effort in the Philippines was 20 Nautilus per one trap. Population density data was also collected in Australia using underwater video cameras and is currently being analyzed. Initial analyses of the underwater footage showed 3-4 times more Nautilus in the area than were caught in the traps. This method will be replicated in the

same area of the Philippines in June 2012. The catch effort data has verified the significantly negative impact of unregulated fisheries on Nautilus populations. Subsequent data collected in June 2012 using underwater cameras will provide further support of the negative impacts of an unregulated fishery. The combined data will be used to support conservation efforts regulating the Nautilus fisheries and international trade of the Nautilus shell.

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Population genetics of neotropic cougars (*Puma concolor*)

Cougars (*Puma concolor*) were extirpated from much of their native range and are considered "near threatened" in Argentina, Brazil, Colombia, and Peru by the IUCN. The majority of cougars reside in the Neotropics; however, little is known about these populations as most studies focus on North American populations. Studying Neotropic cougars is important as the human population in the Neotropics has grown significantly in the last fifty years, resulting in severe loss of cougar habitat without an understanding of the effects on Neotropic cougar populations. Cougars are elusive and difficult to census by traditional methods; however, population estimates and genetic monitoring of Neotropic cougars are essential for identifying isolated populations in need of conservation planning. Scat has commonly been used to noninvasively study the population genetics of elusive carnivores and is ideal for studying Neotropic cougars. This study examines the genetic diversity and population genetic structure of Neotropic cougars using over 600 cougar scat samples from 11 countries. Genetic diversity and population structure is being assessed through amplification of 21 cougar-specific microsatellite loci. Genotypes will be mapped to their GPS collection points and overlaid upon maps of habitat types classified based upon likely use by cougars to identify genetically isolated populations, and infer important corridors for cougar dispersal. Analyses have not yet been completed but we have currently identified over 100 cougar individuals and expect to identify approximately 250-300 individuals. This research will allow for prioritization of cougar management strategies to ensure the viability and connectivity of Neotropic cougar populations.

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Hopping into new territory: A case of amphibian range expansion in New Jersey

Green tree frogs, *Hyla cinerea*, are ubiquitous across their geographic range, from Delaware south along the Atlantic Coastal Plain to Florida, westward along the Gulf Coastal Plain to eastern Texas, and north into the Mississippi River Valley to southern Illinois. In June 2011, a large population of *H. cinerea* was discovered in southwestern New Jersey along the Delaware River. This was the first recorded occurrence of *H. cinerea* in NJ and represents a possible range expansion past their northern-most limit in Delaware. Subsequent reports of this species have been confirmed along the Delaware Bayshore and a more comprehensive survey will be completed in 2012. Northeastward range expansions have been documented in Illinois and recently metamorphosed *H. cinerea* have been found 0.5 km from the nearest breeding habitat, demonstrating dispersal capacity. To determine whether the NJ population was established via colonization by Delaware tree frogs, genetic analyses were undertaken. Toe clips were collected from both populations and partial sequences of the mitochondrial ND1 gene were used to generate a statistical parsimony network. Results indicate that the NJ individuals are closely related to the Delaware population, with some sequences being identical. This relationship is most likely a result of a recent movement of Delaware frogs into NJ. Although movement may have been human-mediated, rising temperatures throughout the eastern and central US are possibly favoring the persistence and establishment of these frogs in new areas.

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Phylogeography and geographic origin of the invasive Nile monitor, *Varanus niloticus*

Invasive species are one of the leading causes of biodiversity loss in the United States. Florida is disproportionately affected by invasive species and each new introduction hastens the deterioration of its fragile ecosystem. The Nile monitor, *Varanus niloticus*, has recently been introduced into the Cape Coral region of Florida, and has the potential to severely disrupt indigenous wildlife populations. The native range of *V. niloticus* covers all of sub-Saharan Africa, encompassing a large variety of different habitats and vegetation zones. This species can reach lengths of up to two meters and its diet ranges from insects to birds and small mammals. The generalist lifestyle of *V. niloticus* could enable it to invade a large portion of the United States. Microsatellites are being used to investigate the within-species genetic structure of *V. niloticus* across Africa. The genotypes of the invasive population can then be compared to samples of known geographic origin. By genetically

determining the specific geographic origin of the introduced population, we can better understand the environmental adaptations of the invasive population in Florida. Ecological niche modeling can be implemented to predict potential areas of colonization in North America. Armed with such predictive awareness, efforts can be made to focus eradication attempts and surveying on these areas in order to prevent the spread of this destructive invader.

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Genetic tools for detecting hybridization in nature rainbow trout

The freshwater fish of the United States face a wide range of serious threats, which have rendered many of them endangered or threatened. One of the more insidious of these threats is hybridization. The three native rainbow trout subspecies of the Kern River basin in California have all had their native ranges subjected to stocking of non-native trout. Beginning in the 1800s, the non-native conspecifics readily interbred with the native fish. This hybridization and the resulting introgression into the native lineage has left large portions of native habitat devoid of any pure native fish. One of the subspecies, the Little Kern golden trout, is now listed as threatened under the ESA, while the other two, the Kern River rainbow trout and the California golden trout, are both considered Species of Special Concern in California. Our work focuses on the Kern River rainbow trout, which has been perhaps the most heavily affected by stocking, since a number of different strains have been stocked into its waters. The principle problem in addressing introgression is that morphological identification of hybrids is often difficult or impossible. Genetic tools, therefore, offer the best methods for management and conservation of these fish. We used single nucleotide polymorphisms (SNPs) and microsatellites to detect introgression in the absence of a type specimen. We have located several populations that have little or no introgression, and may now be used as broodstock for a conservation hatchery. This work raises many important questions about conservation goals and what we should conserve.

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Testing predictive ability of bioclimatic envelope models using data from Alaska

One of the most used modeling strategies to predict potential changes in species distribution is the species' bioclimatic envelope model. However, this strategy has been widely questioned due to its assumptions and uncertainties. Here, we evaluated the accuracy of this approach by comparing niche models against observed records. We built ecological niche models with shrub presence and abundance records across the North Slope of Alaska for the year 2000 and environmental data from 1960-1990 for the same region. Models were then predicted for 1931- 1960. A measure of shrub change was obtained by comparing the 1960-1990 models against 1931-1960 projections. Changes were then compared to observed records of increase in shrub cover over the past 50 years in northern Alaska. Our results show no correlation between the predicted changes and the observed changes. We discuss the limitations of the models and the importance of spatial scale as a key factor of the predictive ability of specie's bioclimatic envelope models.

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A centrury of change in small mammal populations in the Tahoe basin, California

Small mammals play a crucial role in seed dispersal and soil maintenance, yet are a frequently overlooked component of ecosystem function. We investigated patterns of genetic change among 4 species of chipmunks (Neotamias) in the Tahoe Basin, California over the past century to better understand how climate change might impact this community. Chipmunks in the Sierra Nevada have experienced dramatic distributional shifts over the past century in conjunction with an increase in average minimum monthly temperature. Using tissues from both archival and extant individuals we assessed evidence of loss of connectivity and allelic diversity in populations at two sites over a period of 100 years. While there are some similarities in how each species is responding to climate change, there are species specific differences that are causing a dramatic shift in community dynamics. Evidence for change in distributional patterns of these chipmunks suggest that climate change will negatively impact intraspecific relationships as well as functional roles. Temporal genetic analyses such as these can help clarify how climate change may affect ecosystem health and dynamics by disrupting patterns of association among component species.

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Community stewardship for dhole conservation in Kangchenjunga Nepal

Dholes (*Cuon alpinus*) are threatened with extinction- IUCN lists the species as endangered. Although reliable estimates and research studies are lacking, the dholes wild population is estimated to be fewer than 250 individuals in Nepal and fewer than 2500 mature individuals globally. We initiated a dhole study in 2010 which explored the presence of dholes in Kangchenjunga Conservation Area (KCA), Nepal and documented human-wildlife conflict in the area. We used camera trapping (4080 hours), sign survey (150 km), and interviews with local people (n=75) for presence and absence surveys. The camera trapping evidence confirms dhole presence in KCA. The information obtained during the study reveals that dhole depredation to livestock is highest compared to other carnivores in the area. 74% livestock depredation occurred in the pasturelands above 2000m elevation and more than 50% depredation was by dholes in our study site. Most of the local herders regard dholes as pest of the jungle and as a consequence poison the carcasses of animals to minimize the losses of livestock from carnivore attacks. The Kangchenjunga Conservation Area Management Council (KCAMC) has started to include dhole in their livestock insurance program and is conducting a long term dhole study deploying more camera traps and collecting dhole scat for genetic/dietary analysis. Key Words: Dhole, KCA, camera trapping, human-dhole conflict.

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Modeling the habitat preference of large mammals at multiple landscape scales

Because of their size, large mammals must have large home ranges that cover an extensive area within the landscape. This puts them at an increased risk for extinction as available habitat is converted for human use. Resources needed by these animals might operate on different scales within the landscape. Therefore the choice of habitat an animal makes will depend upon what resources it is selecting for and at which scale. Earlier models consider the frequency with which a large mammal occupies a certain area to determine its preferred habitat but do not take into account selection on multiple scales. Here I present a model that can detect habitat selection at multiple landscape scales. To do this a smoothing kernel was applied to landscape variables, which averaged each point and its surrounding neighbors within an increasing radius. A conditional logistic model was then fit to movement data of savannah elephants to determine which combination of landscape parameters at different levels of smoothing best explained the animal movements, measured using AIC. Selection at multiple scales was observed when two separate levels of smoothing resulted in local minima of AIC scores. This model can be applied to movement data of large mammals to detect the scale or scales at which an animal is selecting habitat, providing important information for managers about which areas large mammals are likely to occupy.

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Using mtDNA to indentify primate capture hotspots for the illegal pet trade in Belize

Alouatta pigra, or the Black howler monkey, is an endangered primate species endemic to southeastern Mexico and Central America. *A. pigra* is threatened by habitat loss and fragmentation, and by capture for the illegal pet trade. The goal of this study was to use a mitochondrial DNA marker to compare haplotypes of individuals from known populations within Belize to those confiscated from the illegal pet trade in order to determine the origin of the illegally captured howler monkeys. This in turn would facilitate the identification of primate capture "hotspots" where enforcement and education efforts could be targeted. Additional objectives were to investigate genetic variability and gene flow among populations in Belize, and to demonstrate the utility of non-invasive sampling techniques to trace the origin of illegally captured life wildlife. The first hypervariable region of the mitochondrial DNA control region or "D-loop" was successfully amplified and sequenced from non-invasively collected fecal samples from 87 individuals living in forest fragments throughout Belize. Haplotype analysis showed that *A. pigra* in Belize are acting as a single breeding population with active gene flow occurring between subpopulations; thus we were unable to group the haplotypes by region in order to identify the origin of unknown individuals. Preliminary analysis also shows low levels of genetic diversity; additional analysis of mtDNA from closely related taxa will be conducted to determine if this diversity is within "normal" limits for healthy populations.

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Urban green roofs as migratory bird habitat

Wildlife face an increasingly urbanized landscape. Urban areas are generally comprised of impermeable surface and often lack suitable stopover bird habitat. In New York City, for example, 34% of the surface is rooftop, while only 3% is natural green space. Urban areas have limited land available to dedicate to parks or natural area, thus to create new green space, novel approaches should be taken. We demonstrate that green roofs, roofs covered with growing medium and planted with vegetation, can be a viable bird conservation tool in urban environments. We compared bird and arthropod prey diversity on green roofs in New York City with nearby non-vegetated roofs. To document the presence of birds, we used direct observations and deployed autonomous recording units to record bird vocalizations. To examine prey availability on green roofs, we sampled the arthropod community with both bowl and sticky traps. Preliminary results indicate that during migration up to three times as many bird species use green roofs compared to traditional non-vegetated roofs and that green roofs host a greater number of individuals. Arthropod prey is up to 11 times more abundant on green roofs than nongreen roofs. To our knowledge this is the first study to examine green roofs as migratory bird stopover habitat and our results indicate that green roofs are a sustainable way to provide essential habitat in otherwise depauperate urban environments.

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Fuel treatment impacts on post-wildfire dynamics in dry conifer forests of California

Dry mixed-conifer forests in California are adapted to a frequent, low-severity fire regime. Because of twentieth century fire-suppression, fire frequency has decreased, while the proportion of high-severity fires has increased due to increased tree density and fuel loads. Fuel reduction treatments are increasingly implemented as a means to reduce wildfire severity. We use the largest study to date of post-wildfire fuel treatment effects to ask how interactions between treatment and wildfire affect 1) fire severity patterns, and 2) plant community composition. We sampled from 12 wildfires that burned through fuel treatments in mixed-conifer forest in California. In 10 of the 12 fires we sampled, fire severity and tree mortality were significantly reduced in fuel treatments. This corresponded with a significant increase in litter depth in treated areas after fire, because tree crown torching was reduced in treatments, resulting in abundant needle cast. The effects of fuel treatments on community composition depend on fire. In the absence of fire, treated areas had significantly lower tree seedling abundance at most sites, while effects on shrub seedling abundance and shrub cover were mixed. However, after fire, treated areas at most sites had significantly greater tree seedling abundance compared to untreated areas, whereas shrub seedling abundance and cover was greater in untreated areas. This apparent post-fire shift away from tree recruitment and towards shrub recruitment in untreated forest suggests that by altering fire behavior, treatments may change the post-fire successional trajectory of forest vegetation.

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Predicting volunteer actions to prioritise surveying across large scales

Biodiversity is declining. To prioritise management we need to evaluate the status and distribution of the species we are trying to save. We identified relationships between volunteer survey effort and motivations to prioritise monitoring investments. We developed nine hypotheses of volunteer motivations to predict the probability of a bird survey being undertaken in the biodiversity hotspot of south-western Australia, using data from the New Atlas of Australian Birds. We then established three goals for surveying in the region: 1) equal survey representation, 2) surveys stratified by habitat, or 3) surveys in protected areas. We developed a function to estimate the benefit of investing in professional surveys, given the probability of a volunteer survey occurring and the survey goal, and calculated the cost of meeting a surveying goal with and without accounting for the probability of cells not being surveyed by volunteers. A model combining the location of protected areas, threatened species records, and habitat diversity, was the strongest predictor of the probability of a volunteer survey. Each surveying goal prioritised different areas for future surveying, indicating the importance of setting clear objectives. There were cost savings equating to 75% of the monitoring budget to achieve stratified protected area representation if only protected areas predicted to have a 70% chance of not being surveyed by volunteers were selected. Sampling in survey gaps is required to reduce bias in volunteer-collected datasets. Using models of volunteer behaviour we can identify areas unlikely to be surveyed to make more cost-effective conservation decisions.

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Small farmers and deforestation on the agricultural frontier of Misiones

Northeast Misiones, Argentina contains large remaining fragments of tropical Atlantic Forest, yet has been heavily deforested and transformed in the past half century into a patchwork of exotic timber, small farms, and forest reserves. Many farmers are recent migrants with insecure land tenure who have settled on vacant public and private landholdings. The decisions of small farmers directly impact the persistence of native forest in this matrix, yet their perspective is rarely studied and poorly understood. Describing the pressures they face, perceptions of environmental change, and social values of forests should help inform strategies to support native forest conservation in Misiones while addressing livelihood needs. We conducted semi-structured interviews with 31 families in a frontier settlement in order to understand land use practices. Questions covered sources of income, crop selection, future plans, perceptions of deforestation and native species loss, and recommendations for improved land management. Results indicate that farmers feel pressured to plant tobacco for income, despite intense labor and chemical demands and resulting destruction of forest and soil resources. Many feel constrained by shortterm needs that prevent diversification with other products that could improve long-term resource stability. Forest benefits such as water provision, wood supplies, and temperature moderation were identified, while illegal hunting and tobacco farming were cited as major threats to forests. Many recommended payments for forest conservation or programs to promote and train locals in reforestation of native species. Results will be shared with organizations in Misiones in order to inform on-going conservation and farmer outreach efforts.