AMERICAN MUSEUM ℠ NATURAL HISTORY

# CENTER FOR BIODIVERSITY AND CONSERVATION

# Student Conference on Conservation Science - New York

# POSTER ABSTRACTS

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KELLY BOISVERT, Frances Sze-Ling Chew
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## EVALUATING THE POTENTIAL RESILIENCE OF PIERIDAE BUTTERFLIES TO EXOTIC INVASIVE HOSTS

I will explore the relationships between *Pieris napi oleracea* (Harris, 1829), *Pieris virginiensis* (Edwards, 1870), and two exotic invasive *Brassicaceae* plants- garlic mustard (Alliaria petiolata [Bieb.] Cavara & Grande), and narrow-leaved bittercress (*Cardamine impatiens*) in western Massachusetts. While *A. petiolata* creates a known population sink for some native *Pieris* species, there is evidence that *P. n. oleracea* is adapting to the plant. Meanwhile, *C. impatiens* has recently spread into Massachusetts, and may act as a new viable host plant option. I will comparatively assess *Pieris* responses in terms of host plant preference, larval performance, and the interplay between these responses via a split brood design laboratory rearing experiment. A proper understanding of such interactions will provide important information regarding the possibility of these populations adapting to the exotic *Brassicaceae* that have invaded their habitats. Such adaptations would represent an opportunity for population recovery in *P. n. oleracea*, and range expansion in *P. virginiensis*.

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## WHO BITES THE BULLET FIRST? LEOPARD SUSCEPTIBILITY TO TROPHY HUNTING IN SOUTH AFRICA

Poorly managed trophy hunting is one of the foremost threats to the long-term persistence of leopards in Africa. Male leopards practice non-parental infanticide, and artificially increased levels of male turnover may cause population decline. However, the interests and management objectives of trophy hunters, conservation managers and biologists need not be incompatible. Trophy hunters seek to shoot the most attractive and large individuals, while managers and biologists seek to ensure long-term population persistence through the selective harvesting of a few individuals. At present there is little information available on the population densities of leopards across the 12 states they are hunted in Africa. Quotas are set through a combination of expert guesstimates and a simplified model, correlating rainfall to leopard density. In the absence of robust population estimates, governments may monitor changes in harvest composition over time and use this as an index of population trend, if susceptibility to hunting varies predictably between age and sex classes. Accordingly, we provide the first data on the susceptibility of different leopard cohorts to trophy hunting in southern Africa. We examine cohort susceptibility through a combination of non-baited and baited camera-trapping, radio-telemetry (collected concurrently over four years) and also hunter trophy selectivity surveys. We also provide African governments with the first standardised post-mortem hunting register sheet, developed from leopard age estimates accrued from 15 African leopard scientists. These results augment the Panthera Foundation's pan-African leopard management strategy, implemented in collaboration with several African governments.

CARA BROOK
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## DIVERSITY AND DISEASE: CONSERVATION AND PUBLIC HEALTH ALIGNED ON THE EIGHTH CONTINENT

The role of biodiversity in amplifying or attenuating pathogen transmission is one of the most widely debated topics in disease ecology today. Proponents of the 'Dilution Effect' emphasize the disease-mitigating services of intact ecosystems by suggesting that high levels of host diversity 'dilute' the probability of transmission to specific hosts liable to transmit the pathogen to human populations or domestic livestock. In contrast, for non-host-specific pathogens, more biodiverse systems may instead increase opportunities for transmission to humans. We have explored 'dilution effects' among rodent and bat disease reservoirs along a community biodiversity gradient in and around Ranomafana National Park,

Madagascar. Our work demonstrates the synergistic goals of conservation and human public health initiatives. Some 60% of emerging infections today are derived from animals; we highlight human-pressured regions at risk for disease spillover in a nation where only 10% of the original forest cover remains and high deforestation rates pressure residual forest refuges. Our work demonstrates the disease controlling services of intact ecosystems—a major conservation goal—while simultaneously exploring predictive models for important human health threats.

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## FISH-AMAZBOL: A DATABASE OF FISH SPECIES RICHNESS IN THE BOLIVIA'S AMAZON BASIN

The Bolivian part of the Amazon Basin contains a mega diverse fish fauna in an excellent state of conservation. Since the last decade, this fish fauna has received an increasing attention from scientists and national authorities as fishes represent the most important source of proteins for local human communities. However, this fish fauna still remains today poorly documented. Here, we present the most comprehensive database available for strictly freshwater fishes from the Bolivian Amazon. This database comprises more than 800 described species. To put this number in perspective, this represents around 25% of the all South American ichtyofauna and around 10% of all strictly freshwater fishes inhabiting the planet. To build this database we conducted an extensive literature survey of native and non-native (exotic) fishes inhabiting sub-basins of the Bolivian Amazon. The database, named Fish-AMAZBOL, contains data from more than 200 bibliographic sources including published papers, books, grey literature (reports) and unpublished museum records (ULRA-UMSS fish collection). We hope that this database will help to develop global conservation programmes and contribute to future large scale aquatic ecosystem management.

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## HABITAT LOSS AND THE ILLEGAL SONGBIRD TRADE IN TROPICAL ASIA

Overexploitation and habitat loss are two of the greatest threats facing biodiversity, but there is limited research on trapping, and even less on the interaction between these two processes. Both are especially severe in Southeast Asia, a region with high avian endemism and one of the highest rates of deforestation globally. Market surveys show that the songbird trade is extensive. Nevertheless, the impact of habitat loss and exploitation on wild bird populations is poorly documented. As such, my project investigates the following questions: 1) How does the joint effect of fragmentation and exploitation affect wild bird populations (both in terms of abundance and guild composition)? 2) How do changes in avian communities affect ecosystem function (i. e. insect control and seed dispersal)? My work also assesses the motivators for trapping, informing effective management plans. Furthermore, I will collect time series data on the songbird trade to identify whether or not current levels of harvest correspond to overexploitation. I am using avian surveys in the wild and at market to collect data on population dynamics and market trends. By employing net sweeps, pitfall traps, seed traps, focal watches, and exclosures, I will identify the role that targeted avian species play in insect control and seed dispersal. I anticipate finding that trapping depletes ground and mid-story species, and that trapping and fragmentation lead to increased insect abundance and reduced seed dispersal. My project has implications for landscape and wildlife management and addresses a critically understudied threat.

ADRIENNE CHITAYAT, Beth Kaplin
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## THE EFFECTS OF FOREST FRAGMENTATION ON THE BEHAVIORAL ECOLOGY OF CHIMPANZEES

One of the greatest forces threatening the biodiversity of our planet, is habitat destruction. Fragmentation, the breaking up of extensive habitat into small patches, further exacerbates this critical problem. With anthropogenic forces putting an increasing amount of pressure on our environment, species like chimpanzees have been extirpated from parts of their historic range and become endangered. Chimpanzees are important for many reasons including their integral role to the functioning of their ecosystem as seed dispersers, pollinators, and predators. I plan to conduct a behavioral study on chimpanzees living within an isolated forest fragment in Rwanda. The methods for my research will include observational data collection on diet, activity, and ranging patterns. This data will be used to make a comparison between chimpanzees living within the forest fragment and those living within intact forests for the purpose of evaluating the level of behavioral change that has occurred. I anticipate that the fragmented population does demonstrate behavioral differences from intact forest con-specifics, displaying a behavioral plasticity that may be allowing them to persist within this modified habitat, at least for the time being. For endangered species like the chimpanzee, the time to act is now. As conservations strive to protect, conserve, and manage fragmented populations, knowledge about the behavioral response of chimpanzees to new ecological challenges is key to our assessment of their long term survival. Research around this topic would greatly benefit conservation and management efforts of this valuable species.

ANDREW COLLINS
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## CITIZEN SCIENCE AND CONSERVATION: EXPLORING URBAN BIODIVERSITY

Citizen science is a form of research collaboration that focuses on integrating public outreach and scientific data collection. Involving citizen participants in research projects across various scales not only has the capability to improve scientific outcomes, but also can increase public engagement in science and conservation. With over half of the human population now living in cities, there is a pressing need to understand the ecology of these built environments and improve their resilience as natural systems. Citizen science projects offer a unique opportunity to accomplish these goals by allowing city residents to participate in projects that increase our understanding of urban biodiversity and ecosystem functioning. In this talk I will discuss how current citizen science projects are informing conservation in urban areas. I will also explore the potential to incorporate schools in citizen science research in order to improve student-learning outcomes and increase public science literacy.

SARA COLLINS, Lenore Fahrig
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## INFLUENCES OF AGRICULTURAL LANDSCAPE PATTERN ON AQUATIC BIODIVERSITY

There is need to identify agricultural landscape characteristics that provide refuge for local biodiversity and minimize environmental impacts. Drainage ditches are common features in agriculture. Evidence suggests that ditches support biodiversity and perform important ecosystem services. Agricultural landscape patterns may influence aquatic biodiversity in ditches through interception and uptake of contaminated runoff into adjacent aquatic habitats. Objectives of this research are to identify landscape patterns in farms that support local aquatic biodiversity. We predict that aquatic biodiversity in ditches will be positively correlated with decreased mean field sizes and high proportions of non-farmed cover types in agricultural landscapes due to interception and uptake of agricultural runoff. Forty-four farms representing one of four heterogeneity categories were surveyed during the spring and summer 2012 for anuran (frog and toad) and macroinvertebrate species. Anuran species were identified and assigned abundance rankings following standard anuran auditory survey protocols. Each landscape was visited four times in the evenings between March and June. Macroinvertebrates were sampled from June to August using sweep net surveys. They were sorted in the field and immediately preserved in 70% ethanol. Physical ditch characteristics and water quality parameters were measured. Macroinvertebrate diversity, and anuran diversity and abundance will be analysed to determine if there are relationships

with landscape pattern, using mean field size and proportion of non-farmed cover as independent variables using GIS software. This research will provide valuable information on the significance of farm ditches in supporting aquatic communities and on the impacts of surrounding landscape pattern on these habitats.

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## THE THREEPSINE STICKLEBACK IN ALBERTA: A CANDIDATE FOR ERADICATION OR PROTECTION?

Alberta's freshwater fish fauna is the most depauperate in Canada, and thus its conservation is of crucial importance. Introduced species can wreak havoc on native communities through their intraguild effects as predators and competitors of indigenous fauna. Managers thus focus on the eradication of unintentionally introduced species. Yet, it may be difficult to determine whether particular species have been introduced by humans or whether their arrival pre-dated human interference and they have merely been previously unnoticed. Such a case includes the threespine stickleback in Alberta. This species was first observed in Alberta by Joseph Nelson and Margaret Harris in the 1980's and it was thus deemed an introduced species. The putative source population was Brannen Lake on Vancouver Island. However, preliminary genetic research suggests that the Alberta population might represent a distinct group, unrelated to other threespine stickleback populations that have been studied. More research is needed to increase our understanding of the historical and contemporary processes that contribute to the biogeography of threespine stickleback in Alberta. We use mitochrondrial DNA sequencing to identify the source of the Alberta threespine stickleback and to document its very recent spread within the province. This work will inform management of the species in Alberta.

LAURA CUSSEN, Alexis Mychajliw, Elizabeth A. Hadly
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## APPLYING LOCAL ECOLOGICAL KNOWLEDGE TO THE CONSERVATION OF THE HISPANIOLAN SOLENODON

The Hispaniolan Solenodon, *Solenodon paradoxus*, is one of extant two mammals endemic to the island, and is listed as endangered by the IUCN. Considered a "living fossil" due to its deep evolutionary history, it provides an exceptional opportunity to bring fossils to life in a region whose native biota has been decimated in both geologic and modern time. Little scientific research is available on the solenodon, and grassroots conservation efforts are struggling to curb population declines due to habitat loss and depredation by introduced carnivores. There is an urgent need to educate local residents through outreach efforts, particularly in agricultural settings. We will perform such educational work by producing a children's book about the evolutionary history and modern conservation threats associated with the Hispaniolan solenodon, tracing its survival through ancient catastrophes and reactions to modern threats. We seek an innovative approach for direct dissemination of science in imaginative and accessible ways by integrating known conservation ecology of solenodons with local ecological knowledge. By using empirical results of personal surveys in the Dominican Republic we hope to engage and educate children, and to emphasize actions a child can take to contribute to the solenodon's conservation. We will distribute copies through grassroots conservation groups in the Dominican Republic, particularly The Last Survivors and Grupo Jaragua, and through the zoo and natural history museum in Santo Domingo. A prototype of the book will be available in September 2013. We will evaluate its success by engaging schools in the Dominican Republic following publication.

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## POPULATION PERSISTENCE OF JAGUAR (PANTHERA ONCA) IN THE BRAZILIAN PANTANAL

The jaguar (*Panthera onca*) is a near-threatened species and has suffered a 54% reduction in historic range. Proactive conservation efforts focus on establishing a range-wide corridor network. This study focuses specifically on jaguar population persistence within the Brazilian Pantanal, located at the heart of Panthera Foundation's Jaguar Corridor

Initiative. The overall goal of this project is to quantify the probability of jaguar population persistence over time in sites of differing land use and human pressures, specifically within two protected areas (Pantanal National Park - Matogrossense; RPPN Acurizal) and two working cattle ranches (Fazenda São Bento; Fazenda Jofre) in the Brazilian Pantanal. A Bayesian-based population viability analysis (PVA) will be developed from the collected data, and allow for inter-site comparisons in population characteristics. This study will use a combination of non-invasive field surveys, GPS-collared animals, and genetic techniques to obtain demographic data necessary to develop the PVA and estimate the priors. Genetic and demographic data will be coupled to strengthen inferences on dispersal, as well as inter- and intra-population reproductive rates. Reproductive data will be used to identify source versus sink populations. The PVA will be used to explore probable future scenarios under alternative management techniques.

## KATHERINE DILLIPLANE
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## THE ROLE OF SUB-LETHAL LEAD POISONING IN RAPTOR DEATHS

Fatal lead (Pb) poisoning is a major conservation concern because it is a significant cause of death for many raptor species. Pb levels above 1.2 ppm usually indicate fatal Pb poisoning. However, the physiological effects of sub-lethal Pb poisoning may contribute to non-poisoning causes of death, such as collision trauma or starvation. To date, little information is available about how sub-lethal Pb poisoning affects the interaction between physiology and behavior in raptors. To better understand the effects of sub-lethal Pb poisoning in raptors, I analyzed veterinary necropsy records for Bald (*Haliaeetus leucocephalus*) and Golden (*Aquila chrysaetos*) Eagles in Western Canada that died from collision trauma or starvation. By separating the individual case reports into groups by their diagnosed cause of death and comparing the liver Pb levels in each group against literature-supported thresholds indicative of degrees of Pb poisoning, I determined whether sub-lethal Pb poisoning may have contributed to these eagles' deaths. I found that eagles that died of collision trauma exhibited Pb levels above typical background exposure (>0.2 ppm), while eagles that died of starvation exhibited Pb levels indicative of sub-lethal Pb poisoning (>0.6 ppm). Furthermore, incidences of collision and starvation deaths were not uniformly distributed throughout the year, suggesting that they may be correlated with increased lead ammunition in the environment during or shortly after annual hunting seasons. This correlation further implicates sub-lethal Pb poisoning as a potential contributor to collision and starvation fatalities in eagles.

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## A NEW FROG FROM THE URBAN NORTHEAST US: DISCOVERY, ECOLOGY AND CONSERVATION CONCERNS.

In response to the decline of southern leopard frogs, *Rana sphenocephala* (=*Lithobates sphenocephalus*) from Long Island, New York, we conducted regional surveys between 2003 and 2009 to assess the island-wide status of the species. No extant populations were identified and the species was determined to be effectively extirpated. Our surveys later expanded onto Staten Island, where *R. sphenocephala* was also historically reported to occur, and we were able to confirm the existence of one extant population. This population exhibited atypical behavioral and ecological characteristics however, and subsequent molecular investigation revealed a previously unidentified cryptic species (currently referred to as *R. sp. nov.*), not *R. sphenocephala*. *Rana sphenocephala* and *R. sp. nov.* look alike (which may explain why the new species remained undetected in one of the most well-studied and heavily populated areas on earth until recently) but they utilize different habitats and are bioacoustically distinct. We now believe that the dominant species on Long Island was the new species, and are optimistic that relict populations may survive in habitats

not targeted in our original surveys. This complicated situation demonstrates the potential for finding 'hidden' species in locales rarely associated with contemporary species discovery and underscores challenges at the intersection of conservation, ecology, and taxonomy. It also provides an example of non-disease risk associated with species relocations and reintroductions. Herein, we summarize the discovery and conservation implications, and review the pending species diagnosis and bioacoustic, genetic, and morphological analyses in our taxonomic description.

TIM FRANKSTONE
Mianus River Gorge & Sleepy Hollow High School, Bedford, NY, USA
## THE DIET OF AN INTRA-UNITED STATES EXOTIC MILLIPEDE, BORARIA STRICTA
*Boraria stricta* is a millipede native to the southern Appalachians, but an isolated population was discovered at the Mianus River Gorge Preserve in the early 2000's. Anecdotal evidence suggests that the MRG population is growing rapidly. As a decomposer, *B. stricta* has the potential to drastically alter local soil characteristics, and through bottom-up effects, the entire forest community. Basic life history of this species such as diet and life span are completely unknown. To evaluate the ecological impact of this new species, I sought to determine the diet of *B. stricta* and consumption rates of various soil and litter materials: hardwood-derived humic soil, hemlock-derived soil, hemlock litter, hardwood litter, dead woody material, live moss, and earthworm frass. Preliminary results suggest that *B. stricta* feeds on hardwood leaves and rotted wood. In examining millipede diet, I also developed a low-cost method for keeping this species alive in captivity.

KATELYNN FREI, Beth Kaplin
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## USE OF CAMERAS TO ASSES NOCTURNAL PRIMATES IN NYUNGWE NATIONAL PARK, RWANDA, AFRICA
Primates are a well-studied order, but there is little information and very few studies conducted on nocturnal primate species. Other than increasing species richness in several ecosystems around the world, nocturnal primates play important roles like seed dispersal, seed predators, social interactions, pollination, and overall utilization of distinct niches within their communities. A unique, new method to assess diversity, distribution, and density of nocturnal primates are infrared cameras. The purpose of this study is to obtain the frequency of occurrence of nocturnal primates in habitat types surrounding the Uwinka visitor center in Nyungwe National Park, Rwanda. A total of 25 remote infrared camera traps will be set up along contour lines ranging from 1800-2500m in elevation and spaced approximately 200 meters apart, respectively, using ArcGIS 10 around Uwinka study site. Wood platforms will be built, approximately 1/2m x 0.5m, as a base for fruit bait or an applied scented medium to attract a broad range of targeted species. Placement of the camera will be slightly above these fruit bait stations and pointed to the center of the station. Each camera system will be programmed with a 2-shot interval and a 30 minute delay between each trigger and will be active 24 hrs each day. Capture indices will be calculated based on number of images of a species divided by total trap days in a given habitat. Comparison of differences in primates captured in specific habitat types and elevation gradients will be determined using the Analysis of Variance statistical test.

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## CARNIVORE CONSERVATION IN NORTHWEST UGANDA: ASSESSING HUMAN IMPACTS AND ATTITUDES
Murchison Falls National Park (MFNP), in northwest Uganda, is a biodiversity hotspot and an important tourist attraction. However, increasing human settlements along park borders and ongoing oil exploration within the park raise concern about the effects of human disturbances on wildlife. In particular, anthropogenic disturbances pose serious threats to large carnivores, which are vulnerable to local extirpation. Although large carnivores are charismatic species that

are important in generating ecotourism in Uganda, their populations are not well studied in MFNP. We will explore the effects of human disturbances on large carnivores and other wildlife in MFNP by means of camera-trap surveys. We hypothesize that species richness and carnivore occupancy rates at disturbed sites will be lower than those at undisturbed sites. Disturbed sites will be located adjacent to drill pads or human settlements whereas undisturbed sites will be located at least 1 km from all human structures or roads. Encounter histories will be analyzed to compare occupancy rates of large carnivores between disturbed and undisturbed sites and to examine differences in community structure, species richness and changes over time. Additionally, we will evaluate attitudes towards the park, its wildlife, and oil exploration, and identify costs and benefits associated with living near the park. This information will be collected through focus groups in surrounding villages and interviews with village chairpersons and Uganda Wildlife Authority officials. Field work will commence in the summer of 2013, when we will begin focus groups and conduct a pilot camera study.

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## POPULATION GENETICS OF PALLAS'S CAT IN MONGOLIA

Pallas's cat (*Otocolobus manul*) is a felid species distributed throughout the grasslands and montane steppe of Central Asia. Otocolobus manul is listed as near threatened by IUCN and their population has declined as a result of direct hunting, depletion of prey base and habitat degradation. This project examined the genetic diversity of *O. manul* using 136 scat samples collected from three sites within their Mongolian range. DNA was extracted from each scat sample and eleven microsatellite loci were used to assess the minimum number of individuals, sex ratio, and average heterozygosity. A Population Aggregation Analysis was performed using DNA sequences from two mitochondrial genes: 16S rRNA and cytochrome b oxidase. Additionally, individual genotypes were used to estimate relatedness amongst individuals and utilize landscape genetic tools to further examine population dynamics of Pallas's cats in Mongolia. This information will clarify the current state and health of this felid species in Mongolia, which can aid wildlife managers and conservationists in decision-making processes.

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## EFFECTS OF ECOSYSTEM FRAGMENTATION ON COLORATION IN THE BAHAMAS MOSQUITOFISH

Human-mediated ecological change such as climate change, over-exploitation of animals, and habitat alteration, have been implicated as major drivers of adaptive evolution in natural populations. Determining the direction, magnitude, and consistency of evolutionary responses to anthropogenic change is thus an important area of study. In this study we investigated the effects of anthropogenic ecosystem fragmentation on the evolution of color patters in three different clades of the Bahamas mosquitofish (*Gambusia spp.*) across six different islands of The Bahamas Archipelago. Specifically, we asked: 1) does fragmentation affect male coloration, and 2) are these effects consistent between island populations and clades? We found that coloration differed due to fragmentation, however the direction and magnitude of the change depended on independent histories of populations. For fin color the direction and magnitude of change differed depending on which clade a population belonged to. Fin spotting and lateral spots showed a response to fragmentation that differed primarily between islands. These results suggest that fragmentation can generate significant divergence in phenotypes, but the magnitude and direction of divergence appears to depend on evolutionary history and/ or ecological conditions. The unique phenotypic responses that we identify in this study illustrate the complexities of predicting the direction of human driven evolutionary change.

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## LAND-OWNERSHIP TRANSITIONS AND THE ROLE OF LOCAL TENURE IN CONNECTIVITY CONSERVATION

Tropical Andes ecosystems have been the backdrop of divergent development patterns in the last years. Extraction of massive mineral deposits, deforestation, agribusiness expansion, eradication of illicit crops and political instability are driving fragmentation processes that threaten local biodiversity and hinder the success of conservation initiatives. This study highlights the importance to engage conservation priorities with current social policies, acknowledging that the prevention of further habitat fragmentation relies upon people's aspirations and dependencies on land. Based on data obtained from surveys and semi-structured interviews with landowners, key stakeholders and members of local populations, the research analyses land-ownership transitions and land-uses in the buffer zone of a Colombian biodiversity hotspot. Throughout a case study of a forefront policy promoting land restitution to early local owners that have been violently displaced and dispossessed from their territories, the research identifies impacts and potentials of emerging land-uses of people that are back to the area. Ultimately, this approach aims to enhance new scales of conservation practice, in which ethical issues and commitment with main social vindications will be on the basis of its success. It is the time for Conservation to permeate fragmented lands and shape nucleated practices, sensing transforming areas, introducing intelligible sustainability values in land-use planning, and influencing rural development processes from its smallest units.

LISBET GONZALEZ-OLIVA
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## CONSERVATION OF RARE AND ENDANGERED CUBAN SEABEACH AMARANTH (AMARANTHUS MINIMUS)

Cuba, an important part of hotspot Caribe, is very rich in endemic plant species, but in endangered too. Management for conservation of these endangered species requires knowledge of their ecology, to identify plant traits make them rare and vulnerable to extinction, as well as factors that threaten. In this research were determined life history traits and demographic characteristics of Amaranthus minimus, a very rare and critically endangered Cuban endemic seabeach amaranth. Response to hurricane disturbances and current extinction probability were also assessed. A. minimus emerged as a pioneer species extremely adapted to its littoral and seasonal habitat, with a specialized dispersal strategy, a rich seed bank and variable germination rate which are key life history traits. A. minimus also exhibited a metapopulation structure, seven local populations with seasonal fluctuations in population size and structure. "Hurricane tides" emerged as an effective dispersal agent and a key factor in metapopulation dynamics. Four of these seven local populations exhibited a high probability of extinction, including the population under strict protection, but species persistence depends at first place on the state of metapopulation and success of habitat patches colonization mediated by "hurricane tides". Therefore any accurate conservation strategy should focus on the protection and management of the metapopulation, not on a single local population.

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## AVIAN PERCEPTIONS OF PATTERNED GLASS WINDOWS

Collisions with windows are a significant cause of avian mortality throughout the world, resulting in the death of hundreds of millions of birds annually. Glass structures are often invisible to flying birds, due to birds' relative difficulty in perceiving transparent and reflective surfaces as distinct from the surrounding airspace. One method used to reduce avian collisions is to install patterned glass, designed with the goal of creating a surface more visible to birds. A previous study suggested that most songbirds avoid flying through a horizontal space less than 5 cm high or a vertical space less than 10 cm wide, and several styles of patterned glass exhibit distinctive patterns based on this rule. However, the relationship between patterned glass, avian visual perception, and avian collisions is not well understood. To determine which patterns best reduce bird-window collisions, I am conducting a series of flight tunnel choice experiments using variously patterned glass. Birds are released into the tunnel, fly towards two different glass panes, and avoid the pane

detected first. Using the same method, I am also determining if patterned glass consistent with the 5 cm x 10 cm rule is more readily avoided than patterns that deviate from this rule. The results of these experiments will increase our understanding of avian visual perception, reveal glass patterns more visible to birds, and help reduce avian mortality caused by collisions with windows.

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A TREASURE CHEST OF UNEXPLORED DIVERSITY: FEATHER MITES OF ENDANGERED BIRDS IN BRAZIL

Brazil currently harbors the second largest bird diversity of the world, but ranks first on the number of birds endangered of extinction. In general, a given bird has a distinct fauna of feather mites (*Acari*), which occupy different microhabitats (e. g. head, wing or tail feathers). Feather mites are often highly host-specific, and some passerines can host up to 10 different mite species. Given the rich bird fauna of Brazil (~1800 spp.), it has been said that about 900 to 5300 mite species are expected to be found. Nevertheless, only about 200 mite species have been reported from that country; clearly, the great majority of feather mites are still undescribed. The aim of this work is to report the feather mites from Brazilian birds included in the red list of endangered species. Birds were captured with mist-nets and released after feather examination. Feather mites were collected from the following bird species: 1) endangered: *Formicivora erythronotos, Stymphalornis acutirostris; 2) vulnerable: Phylloscartes kronei, Hemitriccus furcatus, Dysithamnus plumbeus, Tangara peruviana*; 3) nearly endangered: *Ramphodon naevius, Picumnus fulvescens, Cercomacra brasiliana, Thraupis cyanoptera*. Many of the birds examined have for the first time their mites revealed. Some mite species were recently described, and others will be soon described. An undescribed genus of mite from the family *Proctophyllodidae* was found on *Hemitriccus furcatus*. In conclusion, not only these charismatic animals (birds) are in risk of extinction, but so as their whole feather mite fauna. And we don't know even a small fraction of it yet.

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MICROBES AND HOST PHYSIOLOGY - AN UNDERSTANDING OF HEALTH AT MULTIPLE BIOLOGICAL LEVELS

Symbiotic interactions between hosts and their microbial communities have been described including immune system development. Diversity and composition of the microbiota in mammals, the relationship to host wellness, and the influence of human-driven environmental stressors on these factors have not been well studied. This study seeks to assess the influence of heavy metal contamination on mammal microbiome diversity and composition. The main goal is to compare the influence of heavy metal exposure on the microbiota structure and host health status of a terrestrial mammal community including gray squirrel, raccoon, beaver, river otter and feral swine, in contaminated and uncontaminated areas of the Savannah River Site (Aiken, South Carolina). Blood, fecal and intestinal tissue/content will be sampled from each euthanized individual (n=20 per species). Metagenomic techniques will identify the intra- and inter- specific diversity of microbes. Hematological and biochemical analysis will inform about metabolic and organic functioning. Histological examination will explore pathological intestinal conditions. I expect to find a higher impact on the microbiota community composition (decreased species richness and diversity) of mammals inhabiting highly polluted areas (particularly carnivores living on aquatic habitats), which would show more impaired health parameters. The expected findings will provide novel insights to the dynamics of microflora communities and their relationship to their hosts. This research will contribute to the understanding of the detrimental effect of environmental contaminants on biodiversity at multiple biological scales, from micro to macro-organisms, and its implications for the integrity of global ecosystem health.

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## LONG-TERM TRENDS IN FISH COMMUNITIES IN THE HUDSON RIVER ESTUARY

The River Project has been collecting data on the presence of fish species in the Hudson River estuary since 1988. Using this data, I determined which species tend to cohabitate in the estuary. These results may provide insight into which species share the same environmental needs and identify indicator species for community health. I performed Spearman rank correlations for the abundances of each pair of species caught in traps every month. Also, I tested whether changes in water temperature influence the abundances of different fish species in the estuary. For this second analysis, I performed quassipoisson regressions to compare the number each species caught to average water temperatures. The Spearman rank analyses revealed 6 pairs of species for which the two species' abundances covaried significantly. Of these 6 pairs, 4 included the Northern Pipefish, 3 included the Oyster Toadfish, and 2 included the Tautog. The quasipoisson regressions revealed significant correlations between catch abundance and temperature for 7 species. Positive correlations between catch and temperature occurred for the Atlantic Silverside, Oyster Toadfish, Winter Flounder, Northern Pipefish, and Tautog. Negative correlations between catch and temperature occurred for the Rock Gunnel and Longhorn Sculpin. This research will provide valuable information on fish community variation in the Hudson River estuary. By understanding how species covary with each other and vary with temperature, we will have a better understanding of how disruptions to the ecosystem may affect fish communities.

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## COMING TO TERMS WITH ASSISTED MIGRATION

In the face of the present biodiversity crisis, assisted migration (also called managed relocation or assisted colonization) has emerged as a new concept to reduce the risk of species extinction caused by climate change. The measure involves moving species or other biological units to their predicted future climatic range, i. e., to areas where the species should be moving on their own, but which they cannot reach due to time limitation and fragmented habitats. During the last decade, this controversial conservation strategy has been mentioned more and more frequently in the literature, and the benefits and constraints of AM are currently being thoroughly debated. However, the idea has been defined, named, and presented inconsistently, which may hamper the discussion, operationalization, and development of the measure. We conducted a literature review and found 30 different terms and almost 50 definitions for describing the measure, reflecting rather different conceptualizations of the idea. Based on our findings and subsequent analyses of terms and definitions, we present a comprehensive definition of the measure and suggest a suitable term for it. In my talk, I will present the main results of this analysis and introduce a definition-based framework for assessing the species-specific need of assisted migration and for operationalizing the concept. I will also elucidate some transdisciplinary research needs to enable the theoretical and practical development of this novel conservation strategy.

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## IS NOISE OR MORTALITY DRIVING ROAD EFFECTS ON BIRDS?

Past studies have shown that there are fewer birds next to busy roads, and most conclude that this road effect is caused by traffic noise. However, traffic noise is typically correlated with other factors. We proposed that this road effect is caused by mortality. We collected traffic noise and point count data in forests adjacent to high traffic roads in Eastern Ontario, Canada. Sites were selected to have either roads cutting through forest, or to have roads with forest on one side and an agricultural clearings on the other. We hypothesized that road mortality should be higher in the former than in the latter since forest birds are more likely to attempt to cross narrow gaps in the forest. We predicted that if the road effect on birds is driven by mortality: 1) the road effect should be stronger at sites with smaller gaps; 2) the road

effect should increase throughout the season (as deaths increase); and 3) these two variables (gap size and time) should explain the road effect better than noise. Neither gap size nor time alone explained the decreased richness of forest species with proximity to roads. However, over the course of the breeding season, the presence of birds next to the road decreased more markedly at sites with smaller gaps, suggesting that mortality may be an important factor. This implies that measures designed to reduce noise pollution from roads may not be sufficient to mitigate the effects of roads on birds.

CAROLYN KOESTNER
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DAY AND SEASONAL ACTIVITY PATTERNS OF COYOTES IN THE NYC METROPOLITAN AREA
In 2011 and 2012, camera traps were deployed to parks and nature preserves in NYC and the surrounding suburbs to investigate the distribution of coyotes in the NYC metropolitan area. I used this camera trap data to examine the activity patterns of coyotes with regard to diel and seasonal variations in the number of photos. When studying activity patterns over multiple seasons in a region well north or south of the equator, using clock time (0-24 hours) can lead to misleading results owing to changes in the earth's axis and therefore shifts in the time of sunrise and sunset. To avoid this confounding variability, I used U. S. Naval Observatory records of astronomical data to categorized all photographs as either crepuscular (1 hour +/- sun rise and set), day, or night. Preliminary results suggest that NYC coyotes are most active at night, dawn, and dusk reflecting results of earlier studies on urban coyotes.

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SEED SHARING NETWORK PROPERTIES AND AGROECOSYSTEM RESILIENCE
Agroecosystems around the world are currently undergoing a simplification at all scales, from deliberate reductions of intraspecific genetic diversity to reduced landscape heterogeneity. Traditional farmers around the world can counteract this simplification by maintaining a diversity of cultivars that are adapted to local environments and preferences and by dispersing these cultivars through social networks. We investigated how the structural features of farmer social networks influence the persistence of seed varieties that circulate within the network. Our methods included theoretical experiments that independently contrasted different levels of the structural properties of networks (nestedness, reciprocity, and connectance) as well as process rates (extinction rate, seed diffusion rate between farmers, seed diffusion rate from background). Our findings suggested that no single variable can account for the variation of diversity, but rather that diversity is the result of the complex interactions among these variables. This project was one of the first attempts at tackling metapopulation dynamics on directed graphs and provided some first steps towards understanding seed exchange networks. Our results will be extended to more detailed analyses of varietal diversity resulting from exchange and cultural practices. This project is relevant to the field of conservation as seed diffusion through farmer social networks may play a fundamental role in maintaining agrobiodiversity and the use of network theory to analyze human seed-sharing networks has potential to provide key insights in to agrobiodiversity conservation.

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NO PLACE LIKE HOME? USING MICROSATELLITES TO DETERMINE NATAL HOMING IN BOG TURTLES
The bog turtle is one of the smallest and most imperiled freshwater turtle species in North America. Conservation management for this species focuses primarily on protecting and restoring the wetland habitat upon which bog turtles rely. However, little is known about this species' nesting habitat requirements or its nesting ecology. Some turtle species exhibit natal homing, i. e., females nest in the same nesting area from which they hatched. If bog turtles also exhibit natal homing, protecting and restoring existing nesting areas should prove a more effective conservation tool than attempting to create new nesting areas. Because of the unreliability of permanently marking hatchlings and the

delayed sexual maturity of females, assessing natal homing from long-term tracking studies is not feasible. This study uses microsatellite analysis to infer relatedness among nesting females. Using 18 previously described microsatellite loci, we are genotyping females who have nested in seven sites in New York State. We will use pairwise comparisons to determine relatedness coefficients between nesting females within a population and distance between their nests. If we find more closely-related females nest in closer proximity, such results will suggest natal homing is present in bog turtles. By better understanding the nesting behavior of bog turtles, we can help improve management decisions on habitat restoration, conservation methods such as translocation, and headstarting programs.

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FACTORS INFLUENCING CONSERVATION BEHAVIOR CHANGE OF WINE PRODUCERS IN CENTRAL CHILE

Chile's Mediterranean habitat has been identified as a biodiversity hotspot due to its high levels of endemism and increasing habitat loss. The wine industry seems to be a strategic partner for conservation in this ecoregion since producers and consumers increasingly value environmental stewardship. This study proposes an organizational application of the theory of planned behavior to investigate the attitudinal and behavioral decision factors related to adopting conservation practices among winegrowers in Chile. The purpose is to examine whether managers' attitudes, social influence, perceived behavioral control and corporate conservation behavior differ between vineyards involved in a sustainability initiative and those not involved. Structured interviews will be conducted with the general manager of each vineyard in the program (n=15, intervention group), and from a convenience sample of vineyards not involved in the program (n=20, control group). I expect to find that the intervention group exhibits higher levels of corporate conservation behavior than the control group. I also expect to see that managers from the intervention group exhibit more positive attitudes toward conservation behaviors, place more importance on social pressures, and exhibit higher levels of perceived behavioral control than managers from the control group. The findings will be used to fine-tune the educational approach of the program and elucidate unexplored ways for encouraging pro-environmental behaviors in agricultural settings. This research will be an important theoretical contribution for the human dimensions of conservation field in Chile, which is essential to address the large challenges facing biological conservation in a highly populated and productive region.

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MODELING FINE-SCALE CORAL CONNECTIVITY ON THE BERMUDA PLATFORM

Thermal stress from climate change has been linked to the declining state of coral reefs worldwide. An understanding of the fine-scale connectivity within a reef system can assist marine reserve design since areas that act as consistent larval sources can be targeted for protection, contributing to system-wide resilience against a shifting climate. Whereas connectivity works to sustain reef communities through the recruitment of coral larvae, connected systems are also susceptible to the invasion of pathogens, predators and competitors. I am testing the assertion that the distribution of a coral species on a local scale is maintained in part by balancing the trade-off between larval recruitment and disease transmission processes. To do so, I am using an ocean circulation model to predict the recruitment of coral larvae on Bermudian reefs, which I am then comparing to in situ survey data. I am also fitting long-term disease data to analytical models that define disease dynamics. It is likely that most reef patches are reliant on self-recruitment, and that those with the highest densities of adult corals will also have the highest number of recruits. It is also predicted that the highest levels of disease incidence will be found in reefs that are densely populated, with relatively isolated individuals presenting significantly lower levels of infection. By examining the dynamic interactions of recruitment and disease, it may be possible to develop a framework that allows managers to prioritize the protection of coral patches based on their role in the overall resilience of a system.

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## POPULATION GENETICS OF JAGUARS(PANTHERA ONCA) FROM BELIZE

The Jaguar is the only species of the genus *Panthera* that can be found in the American continent. Its historical distribution covered southern parts of the USA through southern Argentina, however, during the last 50 years its populations have declined dramatically due to habitat fragmentation, poaching of their prey and direct killing. Jaguars are considered "near threatened" by IUCN and are included on CITES Apendix I. The species represents the largest carnivore in the American continent acting as an umbrella species. Traditional techniques to study jaguars populations, including capture-recapture methods using camera traps and radio telemetry, have provided valuable information on the species, however, more accurate estimates of population density and abundance across a variety of habitats is necessary to properly implement conservation efforts that adequately protect the remaining populations of jaguars. Ecological information alone cannot contribute enough in the long-term survival of the species if its evolutionary potential is not analyzed. Noninvasive genetic techniques have only been addressed in the last 15 years but have enabled a more accurate estimation of population size and density, taking into consideration genetic parameters such as population structure and demographic history that have more robust implications in wide-range conservation efforts of landscape species. Here I present a study on the genetic diversity and population structure of jaguars from Belize using over 600 scat samples assessed through amplification of 12 microsatellite loci. These results contribute in the characterization of the genetic diversity of the species and provide a phylogenetic approach to its conservation.

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## EFFECTS OF ELEVATED TDS ON THE SURVIVAL AND BEHAVIOR OF D. OCHROPHAEUS.

Elevated TDS have been found in streams in Southwestern Pennsylvania due to mine drainage and unconventional natural gas development of the Marcellus Shale. Little is known about the effects of elevated TDS on amphibian behavior. Salamanders play an important role across many trophic levels of stream communities; therefore, any impact on salamander behavior may have an effect on stream communities. This study is also useful to understand the potential of salinity as a contributing factor to worldwide amphibian decline. To understand the chronic effects of elevated TDS, a semi-terrestrial salamander (Allegheny Mountain Dusky Salamander, *D. ochrophaeus*) was repeatedly exposed to one of three solutions that varied in TDS and chemical composition. Solutions were created based on the ion content of previous field samples and had a TDS of 1,000ppm-2,000ppm. Animals were exposed to fresh solutions every day for 26 days and locomotory activity, weight, and feeding were measured. There were significant effects of elevated TDS on survivorship, feeding, and locomotory activity, although effects differed depending on the chemical composition of the solution. Compared to control animals exposed to synthetic spring water, animals exposed to a solution that was high in sulfate experienced reduced survivorship and decreased locomotory activity. Animals exposed to a solution that was high in chloride experienced reduced feeding. Further research is needed to assess the impacts of the particular ions present in the TDS on amphibian behavior.

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## INTEGRATING ANCIENT AND MODERN DNA TO CONSERVE A "LIVING FOSSIL" MAMMAL, THE SOLENDON

Past responses of organisms to climatic and human-induced perturbations as documented in the fossil record can provide unparalleled hindsight into the conservation of their modern analogues. Faunal analyses provide knowledge of past species abundances, geographic ranges, and the chronology of population declines. Subfossil material can yield ancient DNA, providing information on the genetic variation over long timescales, which is particularly useful in understanding genetic responses to population bottlenecks and subsequent demographic recoveries. Here, conservation paleobiological and ancient/modern DNA techniques are applied to the endangered Hispanionlan Solenodon, *Solenodon paradoxus*, the last surviving endemic eulipotyphlan mammal of the Dominican Republic and Haiti. This living fossil is one of the few venomous extant mammals and is recognized as Evolutionarily Distinct and Globally Endangered (EDGE)

by the Zoological Society of London. Modern genetic data will be obtained from collaborations with the Last Survivors and Grupo Jaragua grassroots conservation groups from populations across the Dominican Republic. Ancient DNA will be extracted from museum skins in the US and from subfossils excavated in the Dominican Republic. Mitochondrial genetic diversity will be analyzed using Bayesian methods and serial coalescent modeling to examine changes in effective population size through time as ranges contract in response to climate change and human colonizations. The ultimate goal of this project is to provide conservation practitioners with an understanding of modern genetic diversity and elucidate historic geographic ranges. No conservation genetic studies have been performed for Solenodon to date.

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ECOLOGICAL BASIS FOR ECOTOURISM DEVELOPMENT IN OKOMU NATIONAL PARK, NIGERIA.

Ecotourism has been reported in 2004 by the world tourism organization to be growing three times faster globally than the tourism industry as a whole. In Okomu National Park, of Nigeria, there are several ecological features that could attract tourist to the park. Though many of these are yet to be discovered, protected and properly managed; most of the flora and fauna are under threat despite their ecological importance. This study assessed some ecological basis for the management of ecotourism development in ONP by identifying the various sites of tourist attraction destination potentials and evaluating some ecological resources within the park. A field survey of the park was carried out; animals were surveyed using both direct and indirect enumeration methods. Different sites of tourist attraction destination potentials were also visited. The data collected for the study were analyzed using descriptive statistics. The ecological resources observed during the field survey shows that there is a strong potential for ecotourism development in Okomu National Park. Numerous ecological sites and landscapes have the potentials to be developed into attractive sites and this will help in boosting the parks economic revenue earnings. Also, 6 different species of mammals have been observed to be dominant in the park, these includes Cercopithecus erythrogaster, Cercopithecus mona, Cephalophus maxwelli, Potamocherus porcus, Cercocebus torquatus and Loxodonta africana cycloti. However, for the sustainable management of ecotourism development in ONP to be achieved, a detailed inventory of its ecological resources should be identified and appropriate management plan should be designed.

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CONSERVATION NEEDS MULTIDISCIPLINARY APPROACH! - A TALE OF ORPHAN TIGER CUBS

Tigers (*Panthera tigris*) have suffered a significant population decline throughout their distribution range in 20th century and presently there are six extant tiger subspecies. Literature indicates that the distribution ranges of Bengal tiger and northern Indochinese tiger overlap in regions of northeast India and Myanmar (Luo et al., 2004). In December, 2012 Arunachal Pradesh Forest Department, India, received reports that 3 to 4 orphan tiger cubs were moving in Angrim valley village and lifting domestic animals and preying on local poultry. In response to the reports, a rescue operation was conducted forest department and tiger ecologist to rescue orphan tiger cubs. As the Angrim valley lies near the border of India, China and Myanmar where the distribution ranges of Bengal tiger and northern Indochinese tiger overlaps, there might be possibility that these cubs may be of northern Indochinese subspecies (Panthera tigris corbetti). As it was difficult to ascertain the subspecies status based on morphology, so a genetic evaluation, based on mitochondrial DNA SNP variation was performed. Approximately 4000 base pair of mitochondrial DNA was amplified using the primers designed by luo et al. (2004) and aligned with the reference sequences of different tiger subspecies (downloaded from NCBI). The presence of Bengal tiger specific SNP at position 14618 ('T') in ND6 gene & position 5050 ('T') in ND2 gene and absence of northern Indochinese tiger species specific SNP in Cytochrome b at position 15403 ('A') & 15995 ('A') of mitochondrial gene confirm that the rescued cubs were of Bengal tiger.

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## BEHAVIORAL ECOLOGY OF NON-ADULT WHITE-BEARDED GIBBONS (HYLOBATES ALBIBARBIS)

The activity patterns of eight non-adult Bornean white-bearded gibbons (*Hylobates albibarbis*) was studied in Sabangau's peat-swamp forest in 2009 (dry season) using five-minute interval instantaneous observations (one focal individual/day). We compare our findings to previous reports for adults conspecifics, report the directionality of non-adult play behaviour, and examine the predictive value of weather variables for daily activity patterns. Feeding (39.5%), resting (27.6%) and travelling (23%), were the main activities for juveniles, while playing (42.1%) and clinging from their mothers (38.3%) were for infants. Non-adult animals socialized and observed more and travelled and called less often than adults. Feeding and resting frequency did not differ significantly. Infants engaged in self-centred playing twice often as juveniles and directed most playing attention towards sub-adults (2%). Weather variables were good predictors for certain activities, but no clear patterns for infants and juveniles emerged. The study increases our understanding of this endangered primate's ecology at a habitat type whose valuable ecosystem services as sink of atmospheric carbon (an agent of global warming) are under pressure from the logging and agriculture industry and could benefit from charismatic flagship-species for its protection.

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## MALAGASY ENDEMIC FISH CONSERVATION, NOSIVOLO RIVER CASE

Since 2003, the Conservation International and Durrell (Both international NGOs) undertake a project for the conservation of the endemic fishes in Nosivolo river. This last is the richest river in Madagascar in term of endemic fish. They collaborate with the Department of Animal Biology at the University of Antananarivo for fish inventory and fish population monitoring. The main conservation action is focused on the river planning and management by local people. Our objective is to check the efficiency of the conservation strategy. We compared the fish abundance at the conservation area with the fishing area adjacent and we monitored the fish population trend for consecutives years. We used night observation for fish counting. All fishing activities are prohibited in the conservation area. Khi square test is used for checking the strategy efficiency. As result, nine conservation areas are studied. Significant differences are noticed between conservation area and fishing area. At the beginning in 2007, the strategy is really efficient. But in 2009, with the Malagasy political crisis, it fails. However in 2011, it restarts to be effective again. Between 2007 and 2011, we noticed an increase of *Oxylapia polli* and *Paratilapia sp*. populations but despite of conservation effort, *Katria katria* declines. This results show the effectiveness of the strategy, however it shows also that: river management is a veritable challenge; face to temptation, it is difficult for poor local people to keep not fishing. Other kinds of conservation strategy are probably needed to ensure the perpetuity of these species.

SHANNON REDDY

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## USING CAMERA TRAPS TO TEST THE EFFICIENCY OF HAIR AND BOX TRAPS FOR SAMPLING COYOTES

Hair traps have been widely used for collecting DNA samples from cryptic wildlife species. A number of methods have been used with success for various feline, mustelid, ursine, and canid species. However, coyotes have rarely been the target species and reliable methods for gathering coyote hair samples have not been established. In this study, I experimented with two methods. The first design uses barbed wire deployed at coyote shoulder height in a triangle surrounding a fatty-acid curiosity scent. Second, in preparation for physical trapping of coyotes for a future telemetry study, I deployed Tomahawk traps lined with barbed wire. This last design not only serves as a hair trap, but can also be used to evaluate the time required to habituate coyotes to box traps. In NYC, box traps may be the only publically acceptable method for capturing coyotes. Understanding how coyotes respond to box traps is essential.

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## URBANIZATION THREATS TO SUSTAINABLE WETLANDS PROTECTION: A CASE STUDY OF BUTARE TOWN

To achieve its political strategies related to people welfare, any country has to make a great effort. The sustainable economical and social developments require strong environment management. In Rwanda, urbanization is a continuous process and it's very important to identify areas that may be threatened due to its growth such as wetlands. The government of Rwanda erected environmental policy to be implemented with a view of sustainable protection of all environmental features including wetlands. This research is aiming at assessing the impact of continuing urban encroachment activities in wetlands surrounding Butare town in view to propose GIS implication in decision making for sustainable urban growth. To reach this, the town spatial evolution was examined, urban encroachment activities were monitored and evaluated, related documents were consulted, questionnaire was administrated, GPS points were taken on surveyed households and invading activities, interviews and field observations were used for primary data collection in effort to respond to research questions. Results show a lack of appropriate information from environmental policy and regulations and the local spatial information to guide in monitoring of activities in wetlands which are increasingly degrading them and having thoroughly studied this environmental problem, it suggested decentralizing spatial information and implication of GIS tool to daily guide in environmental management. Taking into consideration the outputs of this research, awareness of neighbors and developers could be emphasized to protect the function and the value of wetlands, avoid their degradation by maintaining wetlands adjacent buffer zone as open space free from all threatening activities.

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## EVALUATING AVIAN ASSEMBLAGES IN DOMINICAN CACAO FARMS: MANAGEMENT AND CONSERVATION

Scientists and policy-makers have promoted the use of agroforestry systems as a conservation strategy in biodiverse regions. It is important to determine the role of organic cacao farms for avian communities in the Caribbean region. This research project will be conducted with the National Aviary, the Ryan Lab and the NGO Grupo Accion Ecologica (GAE) in order to identify "bird-friendly" sustainable management practices in cacao-growing communities from September 2012 through December 2013. The main research objective of this project is to identify the vegetation characteristics that influence avian assemblages in cacao farms in relation to primary rainforests. A secondary objective is to identify the socio-cultural and economic factors influencing management decisions in these farms. As a result, we will determine the optimal vegetation structure and identify preferable management prescriptions. The research protocol includes avian assessments, vegetation surveys and focal interviews. We will use fixer- radius point count data from 62 individual farms. We will use spatial analysis tools and fixed plot surveys to identify dominant tree species, and measure understory density, tree density and ground cover. We will also interview farmers to identify challenges and document local values. We expect that bird community structure in organic cacao farms will vary according to the combination of tree canopy species. Therefore, we expect to find similar bird communities in rainforests and cacao farms with similar vegetation structure. The significance of this project extends beyond its research objectives as we will start a community-education program on site during our field seasons.

ANDREW TILMAN
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## A MODEL OF THE INTERACTIONS BETWEEN HUMANS AND A FISHERY

Coupled social ecological systems model the interactions between humans and ecological populations. In this project I model a fishery and ask how the markets where fish are sold as well as the ecology of the fishery shape decisions of fishermen, and thus the long-term outcomes for the fishery and the people it supports. Consider a coupled ecological and market system. There is a fishery with harvesting by fishermen, and a market where the fishermen sell their catch to the consumers. Each season this process is iterated, and various trends with important conservation consequences can

be considered. First, the health of the fish population can be measured over time. Also, the welfare of the fishermen and the consumers can be assessed. These analyses require that approaches from ecology and economics be combined, to unite the fish population dynamics with the game theoretic behavior of the fishermen. I will analyze the relative effects of the process by which the price for fish is set, the number of fishermen, and the ecology of the fish have on the overall welfare of the three populations considered: fish, fishermen, and consumers. Effective institutions can influence both fishing practices and how fish are sold at market. I will analyze how various management regimes influence expected conservation outcomes for the fishery and determine which of these regimes are implementable.

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COMPARING DEER ABUNDANCE ESTIMATES USING BAITED AND UNBAITED CAMERA STATIONS
Identification of individual branch-antlered bucks, paired with sex-specific detection rates, allows for abundance estimates of the total deer population, as well as for sub-groups (e. g., bucks, does, and fawns). Camera traps provide such data; however, the precision and accuracy around abundance estimates are sensitive to the quality of the buck photos, i. e., how well the antlers in a given photo can be seen and compared to other photos. The use of bait or an attractant can increase the quality of photos by causing deer to stop in front of the camera. However, an assumption of this analysis is that animal movements are not affected by the sampling method. Deviations from this assumption (e. g., using food piles that draw animals from long distances) will artificially inflate deer density in the sampling area. This study evaluated the use of a non-edible curiosity, specifically deer urine, as a method of obtaining high quality photos while not affecting deer movements. Surveys using baited and unbaited camera stations were performed consecutively during the summer of 2012 at the Mianus River Gorge Preserve to determine if deer urine would yield similar estimates but improve precision over unbaited estimates. This research will be used to improve the annual deer surveys at the Gorge, as part of the Preserve's comprehensive deer management program.

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BIODIVERSITY IN AFRICAN FARMLAND DEPENDS ON THE SEX OF THE FARMER
In most of West Africa, where majority of land has already been converted to man-managed habitats, little is known about the impact of agriculture on bird species. We examined the gender differences in farm management and their consequences and then the implications of agricultural intensification on bird communities. Using questionnaires and within field transects, we collected socio-economic and ecological data from 119 fields in Southern Nigeria. Bird distribution across traditional fields showed a gender-influenced pattern: women-managed fields held higher species richness than fields managed by men. Female farmers used more herbicides whilst men weeded more. The weed density was higher on field farmed by women, probably because of the differences in weeding dates. Tree density was higher on field managed by women, as men chopped down more trees. The gender difference in tree density was the main determinant of the higher bird density. The Cassava crop yield did not differ with sex. There is predicted to be marked agricultural intensification in this region. Intensively managed farms use more herbicide and far more fertiliser (almost none is used in traditional fields) and have far fewer trees and birds but higher densities of Palearctic migrants, especially whinchats and yellow wagtails who favour the open habitats. These results have obvious implication for gender based agricultural interventions, for predicting the consequences of intensification and for conservationists placing priorities on Palaearctic migrants or resident birds.

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## A NEW ESTIMATE OF HISTORIC WETLAND LOSS IN HAWAI`I

Wetlands are among the world's most productive, economically valuable ecosystems, providing ecological services valued on the order of $5 trillion per year, and supporting a diversity of endangered and dependent species. They are also considered the most threatened terrestrial ecosystem in the world; in some parts of the United States and Europe, up to 90% of wetlands have been lost to development and water diversions. Historic inventories are essential to understanding human effects on wetland distributions, estimating rates of wetland loss and setting recovery goals. Wetlands in the Hawaiian archipelago support at least 22 species of threatened or endangered plants and animals. The most recent assessments of wetland loss for the main Hawaiian Islands were completed 23 years ago, before significant advances in Geographic Information Systems (GIS) and computing technology. We estimated wetland loss on the 5 biggest Hawaiian Islands since pre-human settlement using the National Wetlands Inventory, hydric soil maps, rainfall, and topographic data. We used the Compound Topographic Index (CTI) to estimate historic wetlands in sites where hydric soil evidence was unavailable or unreliable (e. g., impervious landcover). We found that earlier assessments underestimated wetland loss in Hawaii. We estimate statewide wetland loss at 23%, compared to 12% from earlier estimates. The majority of loss occurred in coastal areas (elevation <300 m) where 61% of wetlands have been lost, while only 8% were lost at higher elevations. We also show that CTI makes a useful complement to hydric soil evidence in estimating wetland loss in highly developed areas.

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## SPATIAL ECOLOGY OF EASTERN HOGNOSE SNAKES AT THE NORTHEASTERN EXTENT OF THEIR RANGE

Eastern Hognose Snakes (*Heterodon platirhinos*) are thought to be declining in many areas, and are considered a "Species of Special Concern" in New York and a "Species of Regional Concern" in the northeast. We studied the spatial ecology of eastern hognose snakes in Saratoga County, NY, at the northern extent of their range in the northeast. We located snakes (n=12) during random encounter surveys and radio-tracked (n=6) those found before August and that were >100g. At each re-location we recorded GPS location, habitat data and behavioral observations. Home range size was determined using both minimum convex polygon (mean= 29.5 ha, range= 1.4 – 66.8 ha) and 95 percent kernel density estimators (mean= 49.3 ha, range= 3.1 – 155.0 ha). The majority of re-locations occurred in forested areas, but compositional analysis revealed that radio-tracked snakes had a strong preference for open areas, in concordance with studies in other parts of the species' range. Open habitat was used heavily after spring emergence and during the nesting season. We found no evidence of communal hibernation or communal nesting at this site. We recommend that conservation action for Eastern Hognose Snakes in the region should focus on preservation of open habitat, particularly during the spring and early summer.

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## CURRENT DISTRIBUTION OF MEXICAN PRIMATES: USING MODELS AS TOOLS OF QUEST ON FIELD

We developed the potential distribution models for all three species of primates that are distributed around the Southeastern Mexico (*Alouatta pigra, A. palliata* and *Ateles geoffroyi*) which are classified as endangered species. The models and a map of vegetation in which monkeys have been recorded were combined for obtaining the models of expected presence-absence. We considered next two conditions for models: 1) if both characteristics were present, then species would be present; and 2) if one of this characteristic was absent, then species would be absent. Then 240 localities around all Southeastern Mexico were chosen and visited for validating presence-absence of species. To date, we have visited 229 localities which had not been visited before in other researches (24 in Quintana Roo State, 67 in Campeche, 8 in Yucatán, 58 in Tabasco, 10 in Chiapas, 31 in Veracruz and 28 in Oaxaca). We have found 144 localities with current presence of some species of primates (30 with *Alouatta palliata*; 42 with *A. pigra*, 22 with *Ateles*

*geoffroyi*, 48 with *A. pigra* and *A. geoffroyi*, 1 with *A. palliata* and *A. geoffroyi* and 2 with *A. pigra* & *A. palliata* sharing the geographic space). We have obtained new records of presence of monkeys by direct observations in 40 places (18 of *Alouatta palliata*, 13 of *Alouatta pigra*, 3 of *Ateles geoffroyi* and 6 of *A. pigra* and *A. geoffroyi* together). Our main contribution is new knowledge about the limits of the distribution of primates in Mexico.

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INVASIVE EARTHWORMS AFFECT SOIL NICHES: IMPLICATIONS FOR ECTOMYCORRHIZAL DIVERSITY
In forested regions of North America with no native earthworms, invasive earthworms from Eurasia have a large impact on the below- and aboveground environment. Research suggests that these invasions alter carbon and nutrient cycling, affect native plants, and facilitate nonnative plant invasion. Although ectomycorrhizal fungi are essential symbionts of many important North American trees, the effect of earthworm invasions on ectomycorrhizal fungal ecology is unknown. We predict that the homogenization of soil horizons by earthworm invasions will result in more uniform soil nutrient availability, thereby decreasing the number of niches available to ectomycorrhizal fungi. In 2012, we sampled four partially-invaded sites in New York and New Hampshire to measure the impact of earthworm invasion on soil properties and ectomycorrhizal diversity. Soil cores were separated by horizon for soil property (C, N, P, cation) and ectomycorrhizal root-tip analyses. Our preliminary results suggest that earthworm-invaded soil cores had a higher similarity index across all soil variables, suggesting that earthworms are homogenizing the soil profile. A decrease in available niches could result in a subsequent decrease in biodiversity and functional diversity, for both the belowground fungal community and their associated plant partners. Future research will elucidate whether ectomycorrhizal communities are affected by earthworm invasions.

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EFFECTS OF INVASION ON THE PACIFIC SHEATH-TAILED BAT
My project aims to inform conservation management by evaluating the indirect effects of exotic species invasion on the endangered population of the Pacific sheath-tailed bat (*Emballonura semicaudata rotensis*) on Aguiguan, Northern Mariana Islands. Two ubiquitous invaders, feral goats (*Capra hircus*) and lantana (*Lantana camara*) have dense populations on Aguiguan, and may alter resource availability for the bat. I will determine the impacts of goats and lantana on *E. s. rotensis* by addressing the following questions: (1) Where do the bats forage and what are their prey?, (2) What is the availability of prey within two types of vegetation?, (3) How does bat habitat and prey compare between islands with and without feral goats?, and (4) How does vegetation respond to goat exclusion? Few studies have examined the effects of invasive species, other than pathogens, on bats. I hypothesize that goats and lantana have indirect, negative effects on E. s. rotensis, because they decrease the availability of suitable habitat and alter insect communities. Illuminating the threats to this endemic species of bat, will have far-reaching implications, as it investigates disturbances that are common to island habitats worldwide.

STEVEN YOO
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USING AUTOMATIC SPECIES RECOGNITION SOFTWARE TO IDENTIFY ANIMALS IN WILDLIFE CAMERA
Species Automatic Recognition (SAR) software can allow for automatic identification of animal species from photographs. My project attempts to modify open-source software for use in identifying species on wildlife cameras. My method first extracts the local feature in the detection area based on gray scale detection. A background subtraction is applied to detect movement from significant differences inside of the video frame (e. g. the moving animal), and also to remove all the non-significant components (the background). This poster will demonstrate the different SAR methods that are available, as well as preliminary results using open-source software.