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Poster Abstracts

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Diagnosing lymphoproliferative disease virus in wild turkeys (*Meleagris gallopavo*)

Wild turkeys (*Meleagris gallopavo*) are an iconic North American species, an integral part of forest food webs, and an important game bird. Restoration efforts have helped populations in New York recover from mid-century lows, but according to the New York Department of Environmental Conservation (NYSDEC), wild turkey numbers have declined since 2007. In 2009, researchers in Georgia identified Lymphoproliferative Disease Virus (LPDV) in wild turkeys throughout the eastern U. S. Prior, this virus had only been documented in domestic turkeys overseas, where sick birds developed internal lesions and flock mortality was nearly 25 percent. More research is needed to determine whether LPDV is playing a role in declining populations, but diagnosis is limited to tissue samples obtained postmortem. This study will investigate the development of a blood test for LPDV, so animals can be tested non-lethally, and the fate of infected birds monitored. Preliminary work using polymerase chain reaction (PCR) to test white blood cells has shown promise as a viable diagnostic, but small sample size has limited validation and the special processing required makes this method cumbersome. I will use paired samples of whole blood and white cells to develop a method using PCR of whole blood, which is easier to work with. Blood will be collected in collaboration with the NYSDEC as they band birds from January to March 2014. Results will be integrated with band return data to monitor the fate of infected birds, making immediate use of this new diagnostic to expand our understanding of LPDV.

Michael Allen, Joanna Burger

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Grassland bird persistence in active hayfields: using refugia to mitigate nest losses

Working hayfields may represent the largest source of grassland bird habitat in the Northeastern US. They are typically harvested in early to mid-June when hay is most nutritious, resulting in dramatic habitat alteration and nest losses. Many birds abandon fields following harvests and consequently experience low re-nesting rates. We will test the hypothesis that leaving uncut patches ("refugia") within a large hayfield in central New Jersey will reduce levels of field abandonment and hasten re-nesting by improving the availability of suitable nesting habitat and invertebrate prey. We predict that 1) grassland birds will be more abundant in refugia post- vs. pre-harvest, 2) nests initiated post-harvest will be closer to refugia than nests initiated pre-harvest, 3) invertebrate prey post-harvest will be more abundant within and near refugia than away from them, and 4) reduced cover in harvested areas will result in warmer micro-climate at nests. Habitat structural quality for three study species – Eastern Meadowlark (*Sturnella magna*), Bobolink (*Dolichonyx oryzivorus*), and Grasshopper Sparrow (*Ammodramus savannarum*) – will be inferred through abundance surveys and nest placement, while food availability will be assessed through invertebrate sampling, incubation attentiveness (temperature dataloggers), and provisioning rates (video monitoring). Five rectangular refugia (0.25 ha each) will be left representing a gradation of rectangular shapes from square (50 x 50 m) to linear (15 x 167 m). Two adjacent fields will have no refugia, and will be harvested on a different schedule, allowing for a 'before-after-control-impact' experimental design.

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Three years of conservation research in a NAUT shell

Although humans are new to planet Earth, we've made our presence felt. In the 1970's, the world decided it wanted the beautiful nautilus shell. In just a few decades of fishing for nautilus (years in some cases), some populations were locally extinct. Others significantly depleted. But the majority of populations were a complete unknown. Over the past three years, our team surveyed nautilus populations to determine the effect of these unregulated fisheries. We concluded that fishery catch rates are significantly less today, population densities are significantly different between fished and un-fished sites, all populations are small and vulnerable, and isolated populations appear to be genetically distinct. But now what? In June 2014, the National Oceanic and Atmospheric Administration Fisheries Division is hosting, and working in conjunction with the United States Fish and Wildlife Service to bring the world's nautilus experts together for a workshop. Here, we will develop the next steps in nautilus conservation. Currently, nautilus are not listed on the International Union for Conservation of Nature Red List or under the Convention on International Trade of Endangered Species (CITES). The goals for the meeting are to assess whether nautilus meet the criterion to be listed under these organizations (based on the data, we believe they do), develop formal proposals to IUCN and CITES for inclusion, and determine the most pressing questions/survey areas to investigate next. Additional sites will be surveyed this summer, so outcome of the workshop is also important to identify the most critical populations to assess.

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Social preference versus ecological suitability of native trees used for afforestation

Tropical forest cover is diminishing at alarming rates and reforestation efforts are not sufficient. The Philippines has experienced some of the greatest forest loss. Recently, there is a lot of focus on conservation and reforestation of the cleared areas in the Philippines. However, there is lack of knowledge on propagation and specific site matching of native species and most projects still use fast growing exotics. The projects that use native trees have been unsuccessful because they plant species valued for their timber, but that have low growth rates and survival in open-field conditions. Also, these native species are chosen without consideration of the needs of the forest community. The objective of this study is to identify native trees that have high growth rates and survival on degraded sites and to identify native trees that are highly valued by the people in forest-dependent communities. We are using DBH, crown position, and vigor measurements of native trees collected in 1996 and 2012 from natural forest plots of different successions. We are calculating growth rates and survival based on these measurements to identify trees that are best suited for planting on degraded sites. We also combine our finding with questionnaire responses from the forest people that described nearly 50 important native trees. We identify species that exhibit good growth rates and survival and that are preferred by the forest communities. Reforestation efforts with these species will yield best results for native forest regeneration and will bring benefits to forest people.

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Avian frugivore and pollinator composition in changing land use systems

Biodiversity conservation calls for identification of biodiversity hotspots where exceptional concentrations of endemic species are undergoing continuous loss of their habitats. Degradation of tropical forests due to land use have resulted in loss wildlife life and associated ecosystem services. Although Arabuko-sokoke forest is a protected area, the neighbouring landscapes are undergoing anthropogenic modifications which could subject it to a mere conservation "island". It is a biodiversity hotspot and one of the Kenya's 60 important bird areas. However, little information is available on effects of land use on different bird guilds and those that offer important ecosystem services in the area. Bird community, vegetation structure and land use characteristics were studied in one primary forest (Arabuko Sokoke forest), one plantation forest and surrounding agricultural farmlands. The study aimed to assess the effects of land use on diversity and abundance of bird frugivores and flower visitors. A total of 81 point counts distributed equally and randomly over the 3 habitat types were surveyed once per month from May 2012 to September 2013. Total bird individuals recorded by sighting and calls formed the abundance at each point count. Bird Species diversity will be measured by Shannon-Wiener Index. ANOVA, regression and multivariate analysis will be performed to determine the response of different bird guilds to different land use systems. The findings are expected to provide a baseline data that would inform decisions on ecosystem management and land use planning for conservation management of bird communities in the area.

Adrienne Chitayat, Beth Kaplin
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Living in a fragment: the behavioral ecology of chimpanzees in Cyamudongo, Rwanda

Habitat fragmentation has rapidly become one of the greatest forces threatening chimpanzees (*Pan troglodytes*) across Africa. Although this endangered species is thought to be particularly vulnerable to fragmentation, little is known about how chimpanzees cope with large-scale environmental change. In an effort to expand our understanding of this topic, I am studying the behavioral ecology of the chimpanzees living in Cyamudongo Forest, a 4 km² isolated forest fragment located in south-west Rwanda, which is a site of the major chimpanzee tourism in Rwanda. Data is being collected on the diet, activity, and ranging patterns of the chimpanzees in Cyamudongo through direct observation and dung sampling. A comparison of chimpanzee behavior in fragment vs. continuous forests will be made by comparing my data with data from previous studies in similar continuous montane forests found in Rwanda, the Democratic Republic of Congo, and Uganda. Additionally, since the chimpanzees in Cyamudongo are currently used for ecotourism, I will assess the impact of tourist's presence on chimpanzee behavior. Knowledge gained through this project can provide insight into how chimpanzees respond to the challenges presented by habitat fragmentation and tourism activities, aiding primate conservationists and forest managers trying to secure a future for the chimpanzees in Cyamudongo and other fragmented forests. This project also aims to foster partnerships and build capacity in Rwanda by employing Rwandan assistants, working with the Rwandan Development Board that manages the national park, and mentoring a Rwandan undergraduate student in the research process.

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How does forest cover change affect flood risk for farmers in Madagascar?

Natural ecosystems are hypothesized to reduce disaster risk by decreasing the exposure of communities to natural hazards. Inland forests have been argued to reduce the frequency and magnitude of floods. Deforestation is hypothesized to increase flood risk. The exact relationship between deforestation and flood risk varies between sites and is influenced by several biophysical factors. We aim to understand this relationship and the impact of subsequent livelihood decisions on forest cover in Madagascar. Much of Madagascar is prone to seasonal floods from storms and cyclones leading to loss of life and property and reduced food output for some of the poorest communities in the country. Madagascar's status as a biodiversity hotspot has resulted in a formal network of protected areas that overlaps substantially with the remaining natural forest cover. This research ultimately investigates the spatial synergies and trade-offs between locally relevant ecosystem services, specifically flood mitigation and biodiversity, for communities living in catchments with protected forests and deforested areas. Methods include the use of ecosystem models to assess the relationship between changes in forest cover and flood risk, and social research methods such as participatory resource mapping and household interviews to identify how flood risk exposure influences livelihoods and subsequent land use decisions. While much attention is being paid to the carbon sequestration service provided by Madagascar's natural forests as a means of securing additional support for conservation, scant attention has been devoted to understanding how well natural forests regulate floods and/or how deforestation may impact this service.

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The black oak gall wasp (*Callirhytis ceropteroides*) on Cape Cod and Martha's Vineyard

Black oak, *Quercus velutina*, is the dominant deciduous tree on Cape Cod and Martha's Vineyard. In recent years, oaks on the cape and the islands have experienced severe canopy loss due to the infestation of the black oak gall wasp (*Callirhytis ceropteroides*). Sandy soil conditions and previous winter moth exposure are two factors that increase oak tree (*Quercus spp.*) vulnerability. Little is known about the lifecycle of *C. ceropteroides* and the taxonomy of the species is still unclear. Our research aims to investigate the lifecycle of the black oak gall wasp, specifically emergence patterns, generation time, oviposition location, host specificity and survival rate. We will also perform DNA extraction, PCR analysis and sequence the CO1 barcoding gene for this species. Using the CO1 gene, we hope to determine if *C. ceropteroides* is the same species that caused extreme canopy loss on Long Island in the 1990s or determine its native origin. Systemic injections are commonly used to manage other gall wasp species, and may mitigate the black oak gall wasp infestation on Cape Cod and Martha's Vineyard. We will evaluate the efficacy of trunk injections of emamectin benzoate and imidacloprid as control agents of the gall wasp. The loss of a tree species that is known for its aesthetic value in residential communities and for wind protection in coastal areas will have both negative ecological and economical impacts on the region. Our research will lay the foundation for future biological control efforts and will help arborists and landowners make future management decisions.

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State and transition in the availability of ecosystem services in the Amazon Delta

The Amazon Delta is located in the Amazon Basin, the largest river basin on the planet and also one of the least understood. The discharge of the Amazon river is responsible for creating a large area along the Northeastern coast of South America where fresh and saltwater mix and sustains a 2,700 km stretch of low-lying, muddy mangrove. Ecosystems such as the Amazon River Basin contribute services to not only the six countries that it encompasses, but globally. Natural and anthropogenic perturbations in the Amazon basin will cause degradation of key ecosystem services, such as carbon storage in biomass and soils, the regulation of water balance and river flow and the modulation of regional climate patterns. The delta is also predicted under climate change scenarios to experience decreases in rainfall in the Eastern Amazon, and it is unclear how this will affect have on ecological processes, conservation of species, and in the availability of ecosystem services. By estimating and monitoring changes in landcover and availability of biomass, through continuous satellite remote sensing observations from Landsat MSS and TM, MODIS and SEAWIFS, we were able to identify the main pressures and drivers of change in ecosystem services such as nutrient

cycling and flood regulation in the Amazon delta. The results illustrate how drivers of change (both human and physical) are impacting ecosystem services in the Amazon delta, and how social and ecological elements interacted over time leading up to its current state.

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Method for noninvasive sex identification of carnivores

Noninvasive sampling provides an efficient and cost effective means of genetically monitoring species. Rather than directly handling organisms for blood or tissue extraction, noninvasive sampling relies on excreta readily obtained without direct contact with the individual. As such, it is considered an ideal method for monitoring, managing, and ultimately conserving wildlife populations with little organismal disturbance. One application of noninvasive sampling has been molecular sex identification of mammals. To date, these methods have focused primarily on individual species or families, as few studies bridge broader taxonomic gaps. This study sought a more universal protocol. Through novel primer design and PCR optimization, we designed an effective and reliable method for the genetic sex identification of the order Carnivora from noninvasive samples. Amplification of a 142bp segment on the sex-determining region (SRY) of the Y-chromosome indicates a male, with multiple trials conferring confidence. This method has proven effective for species within numerous carnivoran families, including Felidae, Phocidae, and Canidae. Carnivores present ideal focal organisms for this study due to their intra-order variability, elusive nature (making noninvasive sampling preferred in population monitoring), and crucial position near the top of most trophic food webs. Establishing a widely applicable and internally confident method for their study will enable more efficient and cost effective monitoring, management, and conservation of carnivores through the establishment of more precise sex ratios.

Caroline DeVan, Daniel Bunker

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Efficacy of deer exclosures as conservation tool for bee communities

White-tailed deer (*Odocoileus virginianus*) are increasingly overabundant in northeastern temperate forests. They have a large impact on plant communities, herbivoring early spring annuals as well as young woody plants. As large deer populations modify the plant community other organisms are affected through trophic cascades. We hypothesize that deer are negatively impacting bees by removing the floral resources and that when deer exclosures preserve floral communities, they will also benefit bee communities. To test this hypothesis we have been sampling bee communities near deer exclosures and away from deer exclosures at Morristown National Historical Park in Morristown, NJ, using pan traps known as "bee bowls." Deer exclosures have been built in many parks throughout the northeastern temperate region as a means of conserving forests and as a part of research efforts to understand deer herbivory impacts. Preliminary results from our first year of sampling indicate that deer exclosures are highly variable in floral resources and do not consistently contain more flowering plants than control sites. As a result, there are not statistically significant differences in richness or abundance of bees between sites near deer exclosures and sites further away.

Erin Dimech

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Segmented filamentous bacteria within the gut microbiota of wild mice

The gastrointestinal tract of mammals contains hundreds of species of commensal bacteria that exist in mutualistic relationships with their host. One species in particular, segmented filamentous bacteria (SFB), have recently been shown to have a large impact on host immune function. SFB modulate the host's immune system and stimulate the protective immunity response of the host upon pathogen infection. Numerous studies show that the composition of the gut microbiota among captive and wild animals of the same species is different, due to changes in environment and diet. In order to make zoological parks the most effective and sustainable conservation tools as possible, it is important to ensure that the health of wild animals entering captivity is not being negatively impacted. I am conducting a study at the Bronx Zoo that takes wild house mice into captivity and examines levels of SFB over multiple generations. Mice have been subjected to two diet treatments, a standard zoo diet and a varied wild-type diet. Fecal samples are being collected bi-weekly for analysis of SFB levels using quantitative PCR. Necropsies are being conducted to see how levels of SFB correlate with overall health of the mice. The results from this study will provide captive facilities with dietary protocols for improved immune function of captive animals. I will also be examining levels of SFB in wild white-footed mice in urban, suburban and rural environments. These results will provide insight on how urbanization and human development may affect the health of wild animal populations.

Stephanie Dowell, Evon Hekkala
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Phylogeography of the widespread Nile monitor, *Varanus niloticus*

Large-scale climatic fluctuations and tectonic shifts throughout Africa have influenced present-day species distributions as well as intraspecific genetic variation. By examining the phylogeography of widespread species, such as the Nile monitor (*Varanus niloticus*), I can gain insight into how historic events have shaped the continent's diversity. *V. niloticus* is distributed throughout most of Sub-Saharan Africa and is largely dependent on permanent sources of water. Historic periods of drought which significantly affected the flow of major river systems likely played a role in structuring *V. niloticus* populations. To examine this idea, I obtained tissue samples from natural history museums and collaborators which span a majority of the species' range. I then sequenced three mitochondrial (ND1, ND2, and ND4) and three nuclear (RAG-1, KIAA1217, and KIAA15649) gene regions known to be variable in the genus *Varanus*. The phylogenetic trees created with this data revealed a large degree of genetic partitioning within *V. niloticus*, separating into a western group (exhibiting the highest level of differentiation) a northern group, and a southern group. West Africa is thought to have contained a forest refuge during the Pleistocene and could potentially explain the high degree of genetic differentiation. The suture zone between the northern and southern genetic groups lies within the Congo Basin and may reflect an ancient connection between the Nile and Congo watersheds. Further investigation with Species Distribution Modeling could help elucidate how *V. niloticus* habitat changed throughout past climates and determine if their historic distribution is congruent with the present-day genetic patterns.

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Population Ecology of *Chrysemys picta* and *Chelydra serpentina* at Black Rock Forest in Cornwall, New York

Chrysemys picta and *Chelydra serpentina* are two of the most abundant and widespread species of freshwater turtle in North America. It is important to study these species in order to better understand their ecology and the health of their natural populations. We focused on populations from Black Rock Forest, a protected area located in Cornwall, New York. Our goals were to estimate the population demographics, genetic diversity, and prevalence of Apicomplexa parasites, blood parasites that cause malaria. We evaluated the following demographic parameters: number of individuals per species and gender, number of individuals captured per pond, number of recaptures (i.e. individuals captured more than once), and inter-pond movements by individuals. Our results showed no gender bias in either species. While *C. serpentina* shows an even distribution across the ponds, most *C. picta* individuals were captured in Aleck pond. However, we do not have information related to capture effort. Most individuals were caught once (n=125/286 for *C. picta* and n=35/54 for *C. serpentina*). We evaluated the haplotype diversity by analyzing the DNA barcoding region (~600 base pairs of the C01 mitochondrial gene 5' end). We found that all the *C. picta* individuals shared the same haplotype, but *C. serpentina* individuals displayed three different haplotypes, two of which had not been published on GenBank.

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Factors influencing perceptions of parks and wildlife in South African communities

The socio-ecological context where protected areas (PA) are embedded is frequently omitted or overlooked, leading to conflicts of rights and access to land and resources, finally resulting in local communities paying a high cost for wildlife protection. Thus, the perceptions and attitudes towards wildlife and PA are shaped by several factors such as history, culture, gender and livelihood strategies, among others. The objective of this study is to identify how gender and livelihood differences influence the attitudes and perceptions of people from communities near to PA in the Bushbuckridge municipality in South Africa. In order to accomplish this goal, and in the context of a broader effort to empower communities by developing an evidence-based adaptive management program, data will be collected in 5-6 villages of the region through randomized livelihood surveys (10% of households in each village), interviews with key informants and discussion groups. The livelihood surveys will include questions about the economical, social, human, and natural capital of every household, as well as questions about the perceptions and attitudes toward wildlife and PA of the region. Additionally, the interviews and discussion groups will contribute qualitative data for the analysis. This knowledge will help to advance the understanding of the social context of PA in the region, and identify some crucial factors important to be targeted in future interventions, particularly regarding participation in decision making processes.

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Top SCUBA diving destination, what is the value? The case of Sipadan, Borneo

Coral reefs at Sipadan Marine Park, Borneo are highly regarded among avid scuba divers as one of the top diving attractions. Its outstanding biodiversity draws thousands of tourists annually and contributes significantly to national income. Unfortunately, anthropogenic activities such as water pollution and destructive fishing practices have gradually degraded its ecosystems. Failure to consider environmental benefits of protecting Sipadan could lead this park to be subject of overexploitation and resulting in environmental degradation. From this perspective, we considered an economic valuation study in an attempt to capture the economic values of protecting and enhancing the environmental status. To our knowledge, this is the first study to value economic benefits of protecting the coral reefs at Sipadan. A choice experiment was used to determine divers' willingness to pay for the conservation of coral reef attributes affecting the diving experience. This approach may shed light on the neglected aspect of economic value through the understanding of the benefits of coral reefs as seen by divers. The outcome could provide economic evidence for the use in conservation measures and integrated in management policy to safeguard the sustainability of coral reefs at Sipadan.

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The secret life of bog turtles: A natural history study of nesting ecology

The International Union for the Conservation of Nature considers turtles the most endangered group of vertebrates, with more than 50 percent threatened with extinction. One of the most imperiled freshwater species is the smallest turtle in North America, the Bog Turtle (*Glyptemys muhlenbergii*). Scientists know little about this rare and cryptic wetland-dwelling turtle's natural history. In our study, we examined fundamental questions of Bog Turtle nesting ecology in nine populations in southeastern New York State. We took morphometric measurements (body size) and placed radio transmitters on adult females. We tracked females during the May-June nesting seasons of 2009-2012, located nests, counted number of eggs (clutch size), and monitored them until hatching (Aug-Sept). We examined clutch size versus body size, calculated incubation time, and analyzed hatching success with and without predator excluders. With a better understanding of the reproductive and nest success of populations, we will provide necessary information for calculating effective population size and viability. Conservation managers can use these estimates to target populations with reduced reproductive success and establish conservation actions such as predator removal, translocations, habitat restoration, or head-starting projects.

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Drivers of recent population trends in UK bats

The UK is home to 18 bat species, vital to pollination, seed dispersal, and pest control. The Bat Conservation Trust (BCT) monitoring program has recruited volunteers since 1997 to collect count data in roosts and field surveys. Recent data shows declines, which could be detrimental to bats' wider ecosystems. The primary hypothesized drivers of population trends are land use and climate. Investigating the trends in detail can advise conservation action and prevent further decline. I aim to explore why specific species in certain areas are experiencing more drastic declines. I use a Generalized Linear Mixed Model (GLMM) to produce trends, with year, count, habitat type, and climate as covariates. Habitat type data for count sites is gathered from the UK Land Cover Map 2007 at a 25m resolution, and climate data comes from the WorldClim database. The GLMM analysis allows for both fixed and random effects, producing a trend that accounts for the elements of randomness in field data collection. The model will show the direction and degree of population change for each species, along with how much these trends are influenced by habitat and climate variables. Additionally, trends may differ between different survey types. Looking at how roost and field survey counts differ for the same species can inform improvements in survey methodology, to ensure thorough and robust data is collected. The results will be applicable to the prioritization of bat conservation, illustrating which species and habitats need more attention, and what conditions may lead to decline.

Anna Filyushkina*University of Copenhagen, Frederiksberg, Copenhagen, Denmark***Multiple ecosystem services in forest management: How do they fit?**

The need for integration of non-market ecosystem services into forest management decisions has been widely acknowledged. However, due to the complexity of interactions between different ecosystem services the trade-offs and synergies are not fully understood. This is the basis for valuing the multi-functionality of ecosystems for human well-being. The objectives of this study were two-fold: 1) to provide insights into trade-offs and synergies between different ecosystem services; 2) to demonstrate how inclusion of different ecosystem services can be accommodated by forest management. Data were collected from a systematic review of previous studies and a Delphi survey involving experts on forest ecosystem services in Nordic countries. Ecosystem services such as carbon sequestration, recreation and aesthetics, biodiversity and timber production were assessed against a set of forest stand attributes, which represent alterations imposed by forest management activities in planted forests. This allowed revealing the presence of functional forms that demonstrate synergies and trade-offs between different ecosystem services. Second step involved a hypothetical forest estate, for which a number of scenarios with different degree of integration of non-market ecosystem services were explored. Scenarios included those on continuum from spatial specialization to multiple use, the latter involving different combinations of ecosystem services. These scenarios were then aligned with forest management alternatives. Findings of this integrative assessment revealed potential for provision of multiple ecosystem services from a forest estate, as well as their interdependence with forest management decisions.

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Human health and the environment: How does fisher morbidity affect fishing methods?

As we recognize links between health and the environment, we have begun to examine a myriad of pathways through which a healthy environment provides for human health. Yet, we are only just beginning to understand the less examined pathway through which human disease affects the environment. Morbidity among household members impacts physical capabilities, income and expenses, caregivers' time, and future outlook, all of which potentially have downstream consequences for how people interact with the environment. We use the case of Lake Victoria, Kenya to ask how illness in household members changes household interactions with the local fishery. At our study site on Mfangano Island, HIV prevalence is estimated at nearly 30% and, we hypothesize, broadly affects how the rural community of artisanal fishers interacts with their environment and provides for fishery sustainability. Using fishery catch data and a longitudinal cohort study of 300 households, we will present data on associations between morbidity and households' use of fishery resources, sustainability and legality of fishing methods, and household fish catch, food security, and fish consumption. Preliminary cross-sectional data from a pilot suggests that even when controlling for income, if adult household members, and adult males in particular, experience substantial morbidity, odds of frequent household fish consumption are halved. Understanding how human health changes interactions with the environment has important implications for environmental sustainability in the Lake Victoria fisheries, and, more broadly, for understanding the mechanisms that provide for or inhibit beneficial environmental practices and outcomes of conservation in rural communities worldwide.

Christina Frare, Evon Hekkala

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A century of genetic change in chipmunk species in the Lake Tahoe Basin, California

Chipmunks (genus: *Neotamias*) play a crucial role in seed dispersal and ecosystem organization, and therefore are indicators of alpine ecosystem health. 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 both archival and extant individuals we are looking at a general loss in habitat connectivity and the associated loss of genetic diversity for the four most common species of chipmunk found in the Tahoe Basin. Contemporary samples were collected across the basin, but concentrated in the developed S. Lake Tahoe area. Historic samples are obtained from museums, and with these samples coming from areas of heavy contemporary sampling, these samples are from the turn of the century, prior to the development of the Lake Tahoe Basin. Microsatellite analysis, along with analysis of mitochondrial genes, and nuclear introns, allow us to identify each of the individuals to species, and assess each of the individuals for evidence of hybridization. Contemporary samples are showing evidence of hybridization, especially between two of the more closely related species in the basin. This could be the result of environmental stress impacting the timing and location of mating for chipmunks, and to understand this better we are currently exploring hybridization frequencies

in historic populations. Microsatellite analysis shows a loss in allelic richness for three of the species over time in conjunction with climate change and the development of the Lake Tahoe Basin, and this will be further explored with niche modeling.

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Assessing impacts to primary productivity at the human-park interface

Human-induced edge effects can significantly alter vegetation patterns along protected area boundaries. Murchison Falls Conservation Area (MFCA), in northwest Uganda, is a biodiversity hotspot threatened by rapidly increasing populations around its borders. We used Normalized Difference Vegetation Index (NDVI), which is valuable in evaluating changes in vegetation dynamics, to quantify edge effects in MFCA. We analyzed 12 eMODIS NDVI images from 2001-2012 to quantify NDVI spatial and temporal heterogeneity in MFCA and the surrounding agricultural landscape. Compared to outside MFCA, the mean NDVI was higher inside the protected area in all years. We did not detect any temporal trends in mean NDVI or coefficient of variation (CV) but found significant spatial trends in mean and CV with distance from MFCA boundary. There was a consistent increasing trend across all years in mean NDVI within MFCA as distance from the boundary increased (mean $R^2=0.56$) and consistent strong negative correlation between CV and distance from the boundary within MFCA (mean $R^2=0.74$). A dramatic difference in mean NDVI values between areas within and just outside MFCA boundaries indicated a "hard edge" rather than a gradual transition and may suggest that areas immediately surrounding MFCA borders are limited in their ability to act as buffer zones. Lower NDVI values inside the park closer to boundaries could be indicative of edge effects caused by resource extraction (legal or illegal), illegal grazing within the park, or encroaching settlements. This study demonstrates the feasibility of using remote sensing data and NDVI to detect edge effects.

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Harnessing Fijian fishermen's ecological knowledge for community-based conservation

Marine protected areas (MPAs) that incorporate traditional beliefs about reef tenure and ecology are generally more successful in reaching conservation goals and ensuring the participation of fishermen on vulnerable tropical reef systems. Fiji possesses a unique system of reef management in which local villages control individual units of a reef, known as qoliqoli, and make independent management decisions based traditional beliefs. This system, known as customary marine tenure, has attracted interest from scientists hoping to set up MPAs in vulnerable regions. As one example of this grassroots participation, Nagigi village in Fiji's Northern Division has expressed interest in setting up an MPA in part of its qoliqoli due to overfishing. In response to this interest, we took a two-pronged approach to assessing Nagigi's fishery status and conservation needs, first conducting a fishery-independent species survey using destructive sampling and then focusing on targeted species identified through fisher interviews. These interviews allowed us to identify heavily targeted species, assess villagers' understanding of reef dynamics over decades of fisheries expansion, and evaluate village support for a proposed conservation program. Based on our findings we recommend a temporary closure to be established for at least 3 years, allowing one of the more important fishery targets, *Lethrinus harak*, to complete at least one generation within the reserve. Our method of combining data about MPA success with the ecologies of heavily targeted species identified through fisher interviews offers a template for future projects that seek to synthesize indigenous peoples' needs and knowledge with conservation concerns.

Dylan Graham

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Aquatic macroinvertebrate diversity upstream/downstream of three road runoff points

To estimate the impact of stormwater runoff from roads and to determine whether installed mediation systems are working I measured macroinvertebrate biodiversity upstream and downstream of three points of entry for road runoff into the Mianus River in Bedford, NY. I placed 2 leaf litter bags filled with 30 grams of mixed deciduous leaves above and below the entry points into the Mianus River. Bags were collected after 4 to 6 weeks and replaced with fresh ones from October 2013 to August 2014. The three sites varied in mediation installations: one had no mediation system and deposited runoff from a lightly used dirt road ("MRR"); the second was a Vortec storm drain system that collected runoff from the intersection of two town roads into the Mianus River ("Mill"); the third was along a major two lane state route, with a catch basin dumping the runoff into a first order tributary to the Mianus River ("PB"). After pulling the bags I examined them for macroinvertebrates and sorted them by taxonomic order

and family. I compared the amount and types of macroinvertebrates between the up and downstream sites. Using Stream Biotic Index(SBI) I graded each site. I found that all sites were "excellent" or "good (SBI<3.75;lower SBI indicates better water quality);" all downstream SBI's had poorer water quality than upstream bags. The Mill site was the worst with a SBI of 4.5 downstream and 2.6 upstream, despite its Vortec system. This indicates the Vortec system should be cleaned or the drain system isn't working properly.

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Conservation of wetland: Value estimation using Choice Experiment

Wetlands that make up a large portion of the area in Malaysia are special because of diverse biological functions, ecosystem service support functions and biodiversity. The Malaysian Wetland Directory has listed about 105 of wetlands sites. However, some wetlands like the Setiu Wetland (SW) faces threats from land reclamation, pollution, and unsustainable management leading to its degradation. The growing number of economic valuation studies on these environmental resources reflects the increasing recognition of the importance of wetlands for human well-being. This study aims to estimate the value of SW based on its environmental attributes and people's willingness to pay for conservation. The Choice Experiment (CE) method was employed to investigate potential alternative management scenarios for SW. A face-to-face interview survey was conducted during the pilot study, collecting 816 of choices data from 68 respondents residing within the wetland area. We report the differences in people willingness to pay on the attributes with respect to the differences in the respondents' socio-demographic characteristics. Different payment vehicles for the conservation of wetland were obtained. The importance of this study is to assist local authorities and other relevant decision makers in formulating sustainable wetland management policy.

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Wildlife management strategies and change in traditional ecological knowledge

Traditional ecological knowledge of wildlife serves as a foundation for sustainable livelihoods and is critical for community-based conservation initiatives. The transmission and maintenance of this knowledge and how the applications for natural resource management influenced them have received limited attention in Mexico and other parts of the world. In the Calakmul region of Mexico, traditional subsistence hunting has been practiced for generations. However, the creation of Wildlife Management Units (UMA) has changed local hunting practices and knowledge about wildlife. This investigation aimed to identify if there is a relationship between wildlife management strategies and change in the processes of transmission and maintenance of knowledge about wildlife. Results show that this knowledge is being lost among new generations due to the influence of external agents and a decrease in local hunting practices. Our results have important implications for development of innovative and sustainable wildlife management incorporating local knowledge and livelihood strategies.

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Ecosystem Management approach for responsible nature based tourism: Mt. Elgon region

Protected areas, especially biosphere reserves, national and provincial parks, are established in part to preserve natural, unaltered ecosystems and species as benchmarks and as areas for scientific study (Slocombe, 1993). The Mt Elgon ecosystem is a forms part of transboundary ecosystem cutting across the Kenya-Uganda border and on the Kenya side and is consists of the protected areas of Mt. Elgon National Park, Trans-Nzoia Forest Reserve, Mt. Elgon Forest Reserve and Chepkitale National Reserve. The Mt Elgon region is susceptible to environmental degradation resulting from divergent, uncontrolled and sometimes conflicting land uses. There is a need to address challenges of managing protected areas such as Mt Elgon ecosystem through integrative management to form a core linkage to characteristics of the study area and responsible nature based tourism development objectives. According to Mercer (2004), ecosystem management is the 'integration of scientific knowledge of ecological relationships within a complex socio-political and values framework towards the goal of protecting indigenous ecosystem integrity over the long term'. Ecosystem management approaches focus on ecological interactions and system behaviour to recommend or facilitate more consensual and a participatory processes (Holmes-Watts, & Watts 2008). Initial results indicate the importance of adopting a non-prescriptive approach and new non-statutory organisations for effective ecosystem management implementation on the ground. Ultimately a synthesis of integrative management frameworks leads to understanding the ecosystem management approach and its desirable characteristics as a criterion for protected area management and conservation for the purpose of achieving responsible nature based tourism development objectives.

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Feeding ecology of sympatric jaguars and pumas in Fireburn Nature Reserve, Belize

Jaguars (*Panthera onca*) and pumas (*Puma concolor*) are opportunistic predators feeding on a wide variety of primarily medium- to large-sized prey species. Understanding coexistence of similar sized sympatric predator species such as jaguars and pumas requires detailed studies examining dietary habits, niche separation, and prey availability. This study investigated dietary food habits of jaguars and pumas by examining genetically identified fecal samples within the Fireburn Nature Reserve at the northeastern coast of Belize, Central America. Food habits were determined based on analysis of prey remnants found within the fecal samples. Occurrence of prey species was simultaneously monitored by remote camera traps. Jaguars ate primarily medium-sized mammals (65.28%, relative prey biomass consumed), followed by turtles (11.57%), snakes (11.57%) and birds (11.57%), whereas pumas ate primarily medium- to large-sized mammals (58.11% and 38.91%, relative prey biomass consumed), followed by small mammals (2.97%) and birds (2.89%). Dietary overlap of this two sympatric species approximated to 38% suggesting that some degree of resource partitioning in relation to dietary habits is present. Levin's niche breadth indices revealed that the diet of jaguars is more general (0.87) than that of pumas (0.48). The jaguars' ability to feed on armored reptiles and their more frequent use of habitats near water compared to pumas gives them the ability to use a larger breadth of habitats and dietary sources, thus in this ecosystem pumas are considered as more vulnerable to human-induced habitat and prey community changes than jaguars. This study provides a better understanding of the ecological interaction of two wild felid species.

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Habitat classification and environmental niches of trees along landscape-scale gradients in the Western Ghats

Niche differentiation, or filtering of species based on abiotic conditions influences community composition of trees at multiple spatial scales. Habitat types can be quantitatively delineated based on community-level differences, reflecting the amount of compositional variation explained by abiotic factors. Further, knowing which abiotic variables amongst a suite of variables distinguish habitats, and their thresholds at which habitat-driven species assemblages are delineated, will help predict compositional shifts due to natural or human-driven changes in abiotic characteristics of habitats. Indicator species, and inter-specific differences in tolerance to a range of abiotic can cast further insight on species-level suitability of habitats and possible niche differentiation. To evaluate this, we used 99 1 ha plots over 22,000 km² in Western Ghats (India), to differentiate compositionally defined habitat types, and thresholds of critical abiotic variables at which habitat transitions occurred. Next, we conducted indicator species analysis to assess the strength of species associations in habitats. We then evaluated pairwise niche differences between abundance of species along gradients of the critical temperature and precipitation identified by MRT. Eight discrete habitat types were delineated. Total annual rainfall was the most important variable driving compositional changes, followed by mean maximum temperature, and seasonality of rainfall. Of 388 species, 243 species showed significant habitat association, and 101 species were restricted to single habitat-types. Further, 29-50% of pairwise comparisons showed significant differences in species distributions along abiotic gradients, precipitation being most important. Our results indicate that rainfall and temperature are influencing tree community assembly at this scale, and compositional differences may be related to pairwise differences in species distributions along abiotic gradients. Future research should assess the role of drought and temperature sensitivity to understand differential survival between species in different habitats.

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Priority effects in commercial traps for black sea bass (*Centropristis striata*)

Structure-oriented fish species, such as black sea bass (BSB, *Centropristis striata*), are challenging to assess by trawl survey because it is impractical to trawl over reefs, wrecks, or other structured habitats. Trap surveys have been proposed as an alternative strategy for assessing structure-oriented fish species, but it is not known whether traps can be used to accurately measure abundance. One crucial and unanswered question is whether priority effects – the effects of previous fish in a trap on subsequent fish entries into that trap – have an impact on abundance measured by traps. To test the role of priority effects in traps, we compared catch per unit effort (CPUE) of BSB caught in traps seeded with males, females or no fish on the continental shelf of NJ. Mean CPUE for both male and female BSB was highest in traps seeded with female BSB, followed by CPUE in control traps, with CPUE in male-seeded

traps lowest of all three groups. Our results suggest that priority effects do impact trap catch rates, and need to be taken into account when analyzing trap data.

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Millipedes take manhattan: Range expansion of *Boraria stricta* into New York

Boraria stricta is a millipede that has a native range in the southern Appalachian region extending from Virginia southward to Georgia. Recently, samples morphologically similar to *B. stricta* were identified in the Mianus River Gorge Preserve (MRGP) in New York, many miles north of its native range. DNA from the MRGP samples was sequenced for the 12S and 16S mitochondrial genes, as well as the intervening tRNA-Valine subunit, to molecularly confirm the morphological identification. Historic samples from the North Carolina State Museum taken from *B. stricta*'s native range were also sequenced for the same mitochondrial gene regions to examine the genetic variation within *B. stricta*. The MRGP individuals were molecularly identical to one another, but exhibited a 10% difference from the only GenBank voucher sequence. Despite the high variation between the MRGP and voucher sequence, the MRGP samples were still most molecularly similar to the *B. stricta* GenBank sequence and the morphological identification was confirmed. Sequences of the historic specimens further demonstrated a high level of genetic variability, both compared to the MRGP and voucher sequences and when compared among themselves. Because the MRGP samples were all molecularly identical, but very different from the historic specimens from the native range, we concluded that the MRGP individuals were most likely introduced by a single anthropogenic event. The high level of variation among the MRGP, voucher, and historic specimens demonstrated that *B. stricta* is a species with a high degree of interspecific genetic variability.

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Microsatellite genetic marker development for gecarcinid land crabs in The Bahamas

The Gecarcinid land crab *Cardisoma guanhumii* (Latreille), ranges throughout the Caribbean, Central America, and Northern South America where it is an important fishery resource. Harvesting pressures and habitat loss are a universal issue through the range and decisions must be made regarding the best way to manage these populations. Catch size and harvest limits have been implemented in Florida, Puerto Rico, Venezuela, and Brazil. Additionally, Brazil has conducted genetic analyses of their land crab populations to aid in establishing management strategies. In the Bahamas, The Crab Replenishment Preserve on Andros Island was created to protect land crab habitat in The Bahamas, though harvest seasons and regulations are non-existent. Conservation genetics data can be added to the pieces of data necessary to aid in the assessment of this important fishery resource, though a lack of polymorphic markers hampers genetic-based conservation for the species. We characterized the first set of microsatellite genetic markers for Gecarcinid Land Crabs. Of the 13 microsatellite loci, eight are polymorphic in the heavily collected populations of *C. guanhumii* on Andros Island, The Bahamas. These markers were utilized to further elucidate the genetic diversity of the land crab populations across the islands of The Bahamas and Coral Gables, Florida, USA. Genetic data and harvest assessment will be paired to understand the status of the land crab fishery in The Bahamas with the goal of sustaining the harvests of this commodity species.

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Scaling bioeroder body size with coral erosion rates

Coral eroding organisms engineer the ecosystem around them through feeding and creating shelter. The rate at which organisms erode coral may depend on underlying allometric scaling laws. However, allometry has yet to be applied to the external effects of an organism, such as ecosystem engineering. Bioeroding organisms that utilize coral for feeding purposes may erode at a rate that is similar to their metabolic rate. Bioeroders that erode coral for shelter may erode just enough coral to make room for their body to fit, so the bioerosion rate for shelter-makers may be proportional to their body size. How bioerosion scales with body size will be determined through data mining the literature for bioeroding organism body size and per capita coral erosion rate, and analyzing the data with a reduced-major axis regression to determine the relationship between the two variables. Understanding coral bioerosion through body size scaling can prove useful for coral reef managers. A relationship between bioeroder body size and its erosion rate can contribute to the conservation of coral reefs. Monitoring coral reef erosion by measuring the erosion rate of each bioeroding species on each reef can be tedious; with an allometric equation, the size-frequency distribution of bioeroders can be determined to get an estimate of coral bioerosion rate on a reef. This study reveals how allometry can be applied to the ecosystem engineering effects of an organism.

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The nesting ecology of the critically endangered bog turtle (*Glyptemys muhlenbergii*)

The International Union for the Conservation of Nature considers turtles the most endangered group of vertebrates, with more than 50 percent threatened with extinction. One of the most imperiled freshwater species is the smallest turtle in North America, the Bog Turtle (*Glyptemys muhlenbergii*). Scientists know little about this rare and cryptic wetland-dwelling turtle's natural history. In our study, we examined fundamental questions of Bog Turtle nesting ecology in nine populations in southeastern New York State. We took morphometric measurements and placed radio transmitters on adult females. We tracked females during the May-June nesting seasons of 2009-2012, located nests, and monitored them until hatching (Aug-Sept). Clutch size ranged from 1-5 eggs, with a mean clutch size of 3.24 eggs. Nine female body size variables (e. g. mass, carapace length) did not correlate with the number of eggs laid in any one year. The mean incubation time across all four years was 80 days. The preliminary mean hatching rate across all sites and all years was 33.3% for unprotected nests and 37.3% for nests with predator excluders. We will also examine nesting success within and across populations by analyzing predation rates, infertility rates, incubation temperatures, and other nest microhabitat conditions. With a better understanding of the reproductive and nest success of populations, we will provide necessary information for calculating effective population size and population viability. Conservation managers can use these estimates to target populations with reduced reproductive success and establish conservation actions such as predator removal, translocations, habitat restoration, or head-starting projects.

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A positive relationship between mobility and habitat specialization in bird species

One trait that may influence the species response to human land use is mobility. However, there are conflicting theories and empirical findings as to whether more mobile species are more or less at risk in human-altered landscapes. Previous simulation modeling supported studies showing greater risk for more mobile species, but was unable to explain why some studies observe less risk for more mobile species. We hypothesized that observations of lower risk in more mobile species may be the result of a correlation between mobility and habitat specialization. If more mobile species tend to have more flexible habitat requirements specialization may be driving the relationship with species risk, as these species are likely to lose proportionally less habitat. In this study we tested for a relationship between species mobility and habitat specialization. We used North American breeding bird surveys and landcover data to empirically estimate the median dispersal distance and habitat specialization of 130 bird species. As expected, we found a relationship between the estimated dispersal distance and habitat specialization; however, the direction of the relationship was opposite to our expectation (i. e. species with longer dispersal distances tended to be more specialized). These results suggest that greater mobility may evolve to compensate for the relatively scarce resources available to habitat specialists. Furthermore it suggests that we should expect greater risk for mobile bird species in human-altered landscapes, as their risk is likely exacerbated by their habitat specialization.

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Forests and well-being in Japan: The relationship between forest area and overwork

The effects of urban expansion and decreased daily interaction with the natural world have considerable impact on human well-being and happiness. People living in Japanese prefectures with less forest cover have higher standardized mortality ratios from cancer than those living in prefectures with higher forest cover. However, green spaces within urban landscapes can provide measurable health benefits and people report increased happiness in these green spaces. One study found that people who live near trees and parks have less cortisol, a stress hormone, in their saliva than those who live in areas with less green space. In Japan, 58% of employees report stress at work with some succumbing to karoshi, or death from overwork. This study applies empirical linkages between green space and human well-being on a national scale, asking 1) Is there a relationship between forest area and overwork across the 47 prefectures of Japan? and 2) How might Shinto shrine forests address the negative effects of overwork in urban landscapes? We correlated the percentage of forest area across the 47 Japanese prefectures with an overwork index derived from average overtime hours and average overtime compensation in the prefectures. Next we mapped 57,742 Shinto shrine forests across Japan and assessed their spatial distribution. We find that forest area is negatively correlated with overwork in Japan, however Shinto shrine forests are prevalent throughout the landscape, including within urban areas, and can provide health benefits to urban workers.

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Community assembly of coral reef fishes along the Melanesian biodiversity gradient

The reefs of the Coral Triangle (the region of the Indo-Pacific ocean bounded by Indonesia, the Philippines, and Papua New Guinea) are the most biodiverse on the planet, with more species of fish, corals, and other marine invertebrates than anywhere else on earth. However, moving southeast from Papua New Guinea into Melanesia, there is a marked decline in biodiversity, with a steep gradient between the reefs of the Coral Triangle and those of peripheral islands from The Solomons out to Fiji. Looking along measures of endemism and of dietary preference, this study examines patterns of community similarity across the biodiversity gradient for 4 reef fish families (*Chaetodontidae*, *Labridae*, *Pomacentridae*, and *Scaridae*) in Melanesia. This study shows both how individual countries harbor unique assemblages of biodiversity, and how those individual communities can be grouped into larger, cohesive regional assemblages, which may be at the appropriate scale for regional conservation goals.

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Estimating snow leopard (*Panthera uncia*) density and distribution in Tajikistan

The snow leopard (*Panthera uncia*) is one of the most endangered and least understood of the large carnivores. The International Union for Conservation of Nature (IUCN) lists the snow leopard as globally endangered with as few as 4,080 individuals remaining in the wild. The mountains of Tajikistan are some of the least studied and least protected ecosystems in Asia. Climate change is a looming threat for these ecosystems, as are anthropogenic effects such as erosion and decreased plant biodiversity due to increased livestock grazing. I am currently leading a camera-based study of snow leopards in Tajikistan's remote and unstudied Hissar Mountain Range. Using snow leopard-specific camera trapping methods I am working to identify individuals and their locations throughout the range and calculate the size and distribution of the local snow leopard population. Besides contributing to global knowledge of snow leopard abundance and distribution, the results of my study will provide the necessary evidence to conserve and restore this regional precious mountain ecosystem, which will be essential for conserving snow leopard and other valuable high alpine species populations. My results will also be useful for informing snow leopard specific management plans in Tajikistan and trans-boundary conservation plans with Uzbekistan, which are currently being revised.

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Effects of fire on greater sage-grouse brood rearing habitat and food resources

The greater sage-grouse (*Centrocercus urophasianus*) is threatened by loss of sagebrush habitat and its range is declining throughout western North America. Sage-grouse habitat use differs seasonally and at different life-history stages; in the winter, the birds require large stands of tall big sagebrush, while in the spring they nest preferentially in medium-height big sagebrush. Summer brood-rearing habitat is characterized by high sagebrush and grass cover and abundant food resources (mainly forbs and invertebrates). I examined the effects of fire on brood-rearing habitat and sage-grouse occurrence in the Centennial Sandhills, Montana. Vegetation characteristics, invertebrate biomass, and sage-grouse occurrence were compared between big sagebrush habitat, three-tip sagebrush habitat, a 2008 prescribed burn of three-tip habitat, and a 2005 wildfire that burned in big sagebrush. In both burned areas three-tip sagebrush was the dominant shrub. Sagebrush cover was lowest in the 2008 burn, but the 2005 burned area had the same cover as unburned three-tip sagebrush habitat. Grass cover did not differ between burned and unburned sites. Forb cover and invertebrate biomass did not differ among habitats, nor did sage-grouse occurrence. My results suggest that while fire may degrade sage-grouse winter and nesting habitat by destroying big sagebrush cover, burning in three-tip sagebrush may have little effect on brood-rearing habitat. While big sagebrush habitat should be preserved, prescribed burning of small portions of three-tip sagebrush habitat for other management objectives appears compatible with sage-grouse conservation, provided availability of resources in the landscape to meet sage-grouse habitat needs across life stages is considered.

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Estimating fossa (*Cryptoprocta ferox*) density in Makira, northeastern Madagascar

Madagascar is one of the world's hottest biodiversity hotspots. The fossa (*Cryptoprocta ferox*) is the largest native predator in Madagascar, hunting prey species that range from frogs and lizards to the largest extant lemur, the indri (*Indri indri*). Little is known about fossa ecology in the eastern rainforests and no estimates of fossa density are available for the Masoala-Makira protected area complex, which is the largest swath of protected forest in Madagascar. Based on density estimates from Ranomafana National Park (southeastern Madagascar), 95% of the eastern fossa population should exist within the Masoala-Makira and the Zahamena-Mantadia-Vohidrazana protected area complexes. These complexes are also the only areas in Madagascar that should hold viable populations of fossa. We used five years of camera trapping data from seven sites across Makira Natural Park, adding up to thirteen surveys, with eight of those being repeat surveys at two long-term sites (Anjanaharibe and Mangabe). We fit mark resight models in Program MARK and spatial capture recapture models in R and JAGS to estimate fossa density. Based on preliminary results, we have found that fossa density showed a slight negative trend over the years at one long-term site (Anjanaharibe) and that density was relatively similar along a gradient of habitat degradation. Using these density estimates, we hope to help the Wildlife Conservation Society (WCS) better conserve and manage fossa populations across the Masoala-Makira complex.

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Rethinking youth capacity in forest governance: The case of Wabane, Cameroon

Building the capacity of and creating sustained partnerships with youths are crucial strategies to achieving sustainable forest governance (SFG). Unfortunately, this has not been given adequate attention in practice by the international and national development stakeholders. The Wabane Subdivision in the South West Region of Cameroon has an approximate population of 45,000 inhabitants with about 70% being youths. This study focused on how building youth capacity can contribute to SFG and on how different stakeholders have been involved in developing youth capacity that foster SFG. We also looked at the attitude and contributions of rural youths towards SFG and the challenges involved. We used mix survey methods including questionnaires, interviews, focus group discussions and field observations. The main findings showed that though youths are willing to contribute positively toward SFG, they are faced with many challenges including insufficient technical and financial capacity coupled to poor livelihood situations. We recorded that 57.7% of youths did not complete primary education due to poor financial situations, thus their engagements in forest-based activities (subsistence farming, hunting, etc) and early marriages. Pulling these arguments together, we recommend potential strategies that may improve youth capacity toward SFG.

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In the eye of the beholder: Perceptions of ecotourism in Algonquin Provincial Park

Since its inception, ecotourism has been promoted as a solution to some of the problems of biodiversity conservation. It has been touted as having the potential to balance the diverse interests of various publics by ensuring the protection of landscapes, offering unique tourism experiences, contributing economically to local communities, and fostering support for conservation efforts. Inconsistent success in achieving these goals, however, suggests that the effectiveness of ecotourism ought to be assessed on a case-specific rather than industry-wide basis. Further, different stakeholders at a specific site are likely to perceive the impacts of ecotourism in different manners. As a step towards understanding how this delicate balance is achieved, my research investigated differing perspectives of ecotourism at the site of Algonquin Provincial Park. I conducted a series of interviews in June through August of 2013 in order to uncover differences in both knowledge of the site and perspectives of ecotourism between two groups of participants: tourists visiting the park and residents living in surrounding areas. Their responses reveal that, to residents, the park is representative of livelihood both in terms of tourism and resource extraction; for tourists, the park represents "pristine nature." The park is staged for various publics, strategically representing those aspects that will be regarded favorably to a given group. These multiple constructions may be beneficial, however, as diverse viewpoints of these participants prompted attitudes and behaviors are advantageous to the park's mandate, ultimately contributing to the success of the park as a site of landscape and biodiversity conservation.

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Blurred lines in conservation: Freshwater mussels gene flow and species boundaries

Freshwater pearly mussels (*Order Unionacea*) are large bivalves that live in the sediments of rivers, streams and lakes. Although this group is highly diverse, it is the most imperiled taxon in the United States (of 298 species, 37 are extinct and 165 critically imperiled). Unionids dispersed into the lower Great Lakes from Ohio and Mississippi River Basins (Interior Basin) or the Atlantic slope after the last glaciation. Species range expansions led to secondary contact between closely related species such as *Lampsilis siliquoidea* (Interior Basin) and *L. radiata* (Atlantic slope) and it has been suggested that they can hybridize, however the prevalence, direction and geographic extent is not well known. The supporting evidence for potential hybridization comes from the presence of morphological and genetic intermediate forms where these species' range overlaps, which has also led to a long history of name confusion and debate on their phylogenetic relationship. The goal of this study is to determine the phylogenetic relationship and levels of intermixing between *Lampsilis siliquoidea* and *L. radiata*. Species boundaries and potential hybridization will be determined using mitochondrial cytochrome oxidase subunit I gene (COI) and 9 microsatellite loci. Preliminary results indicated that COI haplotypes of these two species are distinct. Furthermore, there is evidence of a cryptic lineage within *L. siliquoidea*. Further phylogenetic testing and levels of admixture are currently being conducted. Correct identification of species, potential hybridization and description of hybrid zones is fundamental in developing and implementing measures to conserve and restore unionid species and populations.

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A statistical assessment of risk status for Mexican amphibians

Regarding amphibians, Mexico is the fifth richest country with 378 species, the third place in number of endemics (246), and the second in number of threatened species (211). As many of these species lack demographic data, there is insufficient evidence to assign them into a risk category, while many others have not been assessed at all. The degree of vulnerability of any given species depends on its life history (i. e., intrinsic traits) and on the way they can respond to extrinsic threats, such as habitat loss, presence of invasive species and pathogens, etc. Recent studies have suggested that using both intrinsic and extrinsic traits simultaneously to assess extinction risk might render accurate results, while being quick and cost effective. Thus, our aim was to 1) mine data from the EOL trait bank and the multiple sources available in the Biodiversity Heritage Library for a selected group of Mexican amphibians, and 2) use these data to statistically assess their risk status. Our first objective was accomplished during the NESCENT-EOL-BHL-Research Sprint. Focusing in such a vulnerable and ecologically important group as the amphibians does not only potentiate our conservation efforts, but also have the potential to open the doors to the assessment of other ecologically important groups for which we might lack demographic data.

Rebecca Raffo

Mianus River Gorge / Somers High School, Bedford, NY, USA

Effects of invasive earthworms on plant abundance and diversity in a northeast forest

Since the 1700s, earthworms from Europe and, more recently, Asia have been introduced to North America and have been reproducing and expanding since. These organisms have upset the stability of various ecosystems and negatively impact floral communities. This study, done at Mianus River Gorge Preserve in Bedford, NY, investigated the relationship between plant diversity and the prevalence of worms in vegetation plots. We found that the overall richness and total vegetative cover declined when more worms were present. However, some species of plants followed the opposite trend, suggesting that worms may have no effect or a positive effect on the growth of some species. Unlike species richness and total vegetative cover, diversity amongst plots (measured via Simpson's Diversity Index) did not vary significantly with worm abundance. This research shows a clear correlation between earthworms and plant richness at Mianus, which can provide future researchers with a foundation for further investigating the exact links of this relationship.

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Between "progress" and tradition: Changes in the Awajun traditional food system

One important factor to considerate in relation to the increase of malnutrition in indigenous communities is the diet transition caused by globalization. One of the most studied ethnic groups in Latin America according to nutrition is the Awajún, which have demonstrated to have a nutritious and balanced diet. Nevertheless the present problems of resources access and availability,

deforestation, and increase of food market items have changed the traditional food system resulting in health problems. 220 adults of an Awajun Community in Amazonas between the ages of 18 to 64 years answered a 24 hour food recall, their cholesterol, triglycerides, glucose, and haemoglobin were measured in finger pricks blood samples. Also some anthropometrics measurements were taken: height, weight, BMI, blood pressure and waist-hip ratio. This study will describe the actual food system and health status of the habitants in one Awajun Community. These results will be related with socioeconomic factors and proximity to the main road in order to evaluate the impact of globalization in this community health status. The conclusions of this relationship can be used as a reference for the elaboration of environmental conservation projects in these communities highlighting the importance and impact on their health.

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Quantifying ecological degradation of fragmented forest edges in the Philippines

The rapid disappearance and degradation of tropical forests is a pressing global conservation issue, hastened by accelerating rates of deforestation, climate change, and overexploitation of resources. Research investigating this rapid disappearance is most needed in biodiversity hotspots where dense concentrations of biota are threatened by high rates of habitat loss and forest fragmentation. Forest fragmentation is of particular concern, as it restricts species dispersal and gene flow, leading to isolation of populations. Additionally, research on fragment edges has revealed that the influence of adjacent edges can lead to the further degradation of forest fragments. Therefore, understanding the ecological degradation of forest edges is a critical step in the conservation of fragmented forests. The depth of edge influence depends on changes in forest stand structure and microclimate (primary responses); and corresponding community changes (secondary responses), but these responses are not well understood. I hypothesize (1) the distance of edge influence will be greater for secondary responses than primary responses, (2) secondary responses will start later and persist longer than primary responses, and (3) the depth of edge influence is greater at edges with greater patch contrast. To quantify these responses, I am integrating measurements of a) soil moisture, canopy cover, tree damage and mortality (primary responses); b) understory diversity and density, and c) leaf litter ant richness (secondary responses) along forest-edge transects. This research is being conducted in the Philippines, an understudied, megadiverse tropical archipelago threatened by widespread deforestation.

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Estimating the population density of white-tailed deer in Pelham Bay Park, Bronx

After a nearly 150 year absence, white-tailed deer have begun to colonize parts of New York City and can be found in the northern Bronx and throughout Staten Island. Our objective was to generate the first deer population estimates for Pelham Bay Park (PB), Bronx, NY using infrared cameras from 2011 to 2013 and two analyses for estimating abundance, the Jacobson et al.'s method (1997) and a modified approach. Confidence intervals for total deer abundance for both estimates overlapped suggesting no difference between the two analyses. However, under the modified-Jacobson method, population estimates were more precise and suggested a trend of increasing population size. As of 2013, both estimates indicated that the Pelham Bay Park deer herd is at or is exceeding the threshold density at which forest regeneration may become impacted by overbrowsing.

Sheherazade Sheherazade, Susan Tsang

University of Indonesia, Depok, West Java, Indonesia; City University of New York, The Graduate Center at City University of New York, New York, NY, USA and American Museum of Natural History, New York, NY, USA

Flying fox conservation framework in North Sulawesi

Intense consumption of flying foxes from North Sulawesi, Indonesia has led to local extirpation. To assess local cultural attitudes towards bats, we conducted a survey of local consumption practices and perceptions of bats in January and August 2013 in the 8 major markets of North Sulawesi. The data we collected are essential to successful implementation of long-term efforts in conservation. Like other forms of bushmeat, flying foxes were considered a type of "unique meat" due to its rarity. The local people ate flying foxes at least once a month, but the frequency of consumption increased tenfold around religious holidays, such as Christmas. Approximately 500 metric tons of bats were imported from other provinces, with South Sulawesi being the main provider at 40%. No action has been taken by locals to conserve the bats, as continued abundance in the market masks the effects of the bushmeat trade on wild populations. To control consumption, churches can act as a local conduit for environmental

education and quota enforcement, since consumption is centered around religious celebrations and a majority of the locals are Christians. Legal intervention to regulate the transportation of bats should also be considered, as this can stop the spread of the trade into other provinces. Conservation initiatives must start with very basic concepts of forest preservation and wildlife protection. Later, materials addressing the plight of the flying fox and potential disease transmission can be provided through community education efforts using local university students as active campaigners.

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Applying adaptive network theory to spatial patterns of biodiversity in the Amazon

Tropical forests are complex systems that are constantly shifting, cycling, and adapting in response to a diverse array of drivers. This study seeks to discern patterns of biodiversity at multiple levels of a trophic web in Neotropical lowland forests to better understand how groups of species interact within a complex system, and how spatial and temporal factors influence changes in network topology. Looking at the trophic structure of a community in the western Amazon basin in Brazil, three groups are known to interact: fruiting trees, frugivorous mammals, and Scarabaeinae dung beetles. During seasonal pulses in fruit production, many species of trees produce fruit, multiple groups of mammals consume the fruit, and dung beetles utilize the dung of the mammals for food, shelter, and reproduction. My thesis focuses on evaluating patterns of fine-scale spatial structuring and co-occurrence among these groups in an attempt to discern interaction dynamics across multiple distance scales. Dung beetles have proven to be suitable indicator species of habitat quality within tropical forests, suggesting their potential value in identifying instability or vulnerability within a system. By working to improve our understanding of how tropical ecosystems function as complex networks with adaptive topology, we can better inform conservation efforts more rapidly and with less intensive sampling efforts.

Kristofer Taylor

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Temporal gland streaming patterns in African elephants (*L. africana*) within TME, TZ

Stress, a physiological response to environmental conditions, has serious implications on health and fitness of African elephant populations. In elephants, stress can be identified through the presence of temporal gland streaming, however the main causes of stress in African elephants are not well understood. Field surveys in Lake Manyara National Park, Manyara Ranch, and Tarangire National Park were used to gather data on sex, age, group size, group type, location, and season. A generalized linear mixed model with random effects was used to determine and rank the variables with influence on stress. It was found that elephant group type and group size were the most contributing components of stress. Factors such as sex and season played a less significant role in stress levels within elephants. Use of non-invasive and low-cost methods of determining stress levels, such as temporal streaming, in African elephants have the potential to be widely applied in elephant research and management.

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The impact of bouldering on boulder-associated vegetation

Many popular bouldering sites lie within protected natural areas, yet no research has assessed whether bouldering (climbing of short, vertical boulders) poses a threat to vegetation. The paucity of bouldering research is concerning as: 1) boulder vegetation is often diverse, including rare rock-specific species; 2) bouldering involves passive and often active removal of vegetation and soil; 3) roped climbing has been linked to reductions in cliff vegetation diversity; and 4) bouldering's popularity is growing rapidly, and expanding into more remote areas. This study sought to determine the impact on vegetation of bouldering in the Shawangunk Mountains (Mohonk Preserve, New York) by comparing vegetation differences between climbed and unclimbed boulders, and determining the influence of environment vs. climbing on vegetation. Climbed boulders supported lower species richness and abundance, largely driven by lower lichen, bryophyte, and herbaceous plant abundance and richness on climbed boulders – non-herbaceous vascular plants did not differ significantly between climbed and unclimbed habitats. Despite this, overall climbed and unclimbed boulder community composition was similar, and only 3% of species differed in frequency based on climbing. Climbed boulder features and environment differed from unclimbed boulders in several features: climbed boulders are more overhanging and possess fewer ledges and vertical cracks. Temperature and humidity did not explain overall vegetation abundance and richness, but significantly modeled these factors for bryophyte and lichen independent of climbing effect size. This is the first study to review bouldering's impact on vegetation, and results will enable land managers to better make informed policies regarding bouldering.

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Brain size and female aggression across primate species

Social organization in primates varies greatly between species. This is an important area of study for primate conservation because it affects their ecological role, reproduction dynamics, and movement. How female primates form social structures within groups, such as hierarchies and grooming cliques, has been a topic of intense interest ever since seminal research predicted that food competition shapes female-female relationships in primate groups. Many years of research have shown considerable variability across primate species in dominance behavior, aggression rates, and grooming dynamics. Cross-species comparisons have found interesting correlations between such behavioral measures and brain size (specifically, neocortex ratio), but it is possible that variation in other aspects of primate anatomy influences female social structure. For example, cercopithecine monkeys have cheek pouches, which have been suggested to mitigate predation pressure and/or food competition within groups. I discuss associations between cheek pouches and female-female aggression rates across primate species. In addition, I point to potential links between an extra stomach sac present in some colobine monkeys and food competition. These connections between anatomy and competition levels may help to explain some of the variation in social organization seen across primates. In addition, they relate to many aspects of primate socioecology, such as their metabolism and feeding patterns, which can give important clues as to the conservation needs of particular species.

John Vanek

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Ecology of a listed snake species on a popular tourist beach

The ecology and natural history of *Heterodon platirhinos* (Eastern Hog-nosed Snake) is poorly understood, despite noted declines and protected status in many northeastern states. The Eastern Hog-nosed Snake is traditionally thought of as an upland species, denizen of xeric pine-barrens and scrub, but also occurs on barrier islands. Recent telemetry work in NH, MA, and upstate NY has shed light on home range and macro-habitat selection in mainland populations, but the ecology of barrier island snakes has been largely ignored. In 2013, we identified a remnant population of *H. platirhinos* on a NY barrier island that is visited by >6 million tourists annually. Surprisingly, this population is likely the only remaining location for this species in all of western Long Island, which was historically known for high abundance of hog-nosed snakes. In 2013, we began a radio-telemetry and mark-recapture study to better understand the ecology of insular snakes. Preliminary results identified 37 snakes of all age classes. All adult snakes were small ($x = 105.3 \pm 5.4$ g) and phenotypically similar. Tracking revealed small home ranges (< 10 ha) and high usage of invasive Phragmites marsh, a novel habitat type for this species. All radio-tracked snakes hibernated individually ($n=8$), and were never observed crossing paved roads. Overall, we suspect this is a large population, as there were no re-captures, and new snakes were consistently found up until 31-Oct. Telemetry and mark-recapture will resume in 2014 to allow for population modelling and better estimates of home-range, dispersal, and habitat utilization.

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Disturbances shift functional trait diversity across US temperate forests

Natural disturbances heavily structure temperate forests in the eastern United States. Early successional tree species rely on openings in the forest canopy for recruitment and disturbances shift the species composition. Today's forests carry the legacy of widespread 19th century clearing for agriculture and logging, and largely consist of young to intermediate aged stands that have regenerated following widespread agricultural abandonment. They still carry this historical signature and are subject to ongoing natural and anthropogenic forces such as climate change, urbanization, and introduced pests. Assessing the current state of forests is pivotal in projecting their current successional trajectories and designing conservation strategies. The functional traits of tree species present an opportunity for mechanistic understanding of tree recruitment following ongoing forest disturbances. Using forest plot data on over 30,000 forest stands from the USDA's Forest Inventory and Analysis database, we found that older forest stands contain species with higher seed mass and wood density, representing a shift from species favoring colonization and rapid growth to species with higher sapling survival and increased longevity. This relationship is most pronounced in higher latitude ecoregions (seed mass: $r^2 = 0.22$; wood density: $r^2 = 0.17$), and not apparent at lower latitude ecoregions ($r^2 = 0.041$; 0.025). Plots resampled following a disturbance show large shifts in trait diversity in the seedling and sapling layer, and increasing variation of adult trait diversity as the intensity of disturbance increases. Interestingly, shifts in trait values are not predictable nor unidirectional, suggesting high influence from alternative factors following disturbance.

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Estimating viral diversity in the common vampire bat (*Desmodus rotundus*)

Bats represent approximately 20% of all mammals with over 1,200 different species distributed worldwide. Certain bat species serve as the reservoirs for viral diseases including *Henipa*-, *Lyssa*-, *Corona*-, and *Filoviruses*, which pose serious threats to human health. However, for many bat species, ecological patterns of viral diversity remain uncharacterized. The common vampire bat, *Desmodus rotundus*, has historically been a species of interest due to its hematophagous feeding habit. Although these bats more frequently feed on the blood of non-human animals such as cows and other livestock, the potential for interspecies disease transmission via human bites makes them a species of particular concern. Rabies and other lyssaviruses have been well studied in these bats, and other viruses such as coronaviruses and adenoviruses have also been detected. However, the total viral diversity hosted by *D. rotundus*, and the ecology which may contribute to disease spread, remains largely unknown. The goal of this study is to investigate unknown viral diversity in *D. rotundus* from Guatemala and Belize, and to analyze the distribution of these viruses in the context of the host species and its ecology. Since vampire bats (and many other bats) frequently come into contact with livestock and human populations, developing conservation strategies for protecting certain habitats may provide effective solutions for mitigating the potential for future disease spread.

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Environmental factors affecting ranavirus prevalence in aquatic-breeding amphibians

Emerging infectious diseases have been implicated as contributing factors to recent amphibian population declines. One such disease is ranavirus, caused by a group of viruses documented in fish, reptiles, and amphibians on six continents. Mortality rates exceed 90% at larval stages of many aquatic-breeding amphibian species. Although much has been learned about ranavirus ecology, pathology, and host susceptibility through laboratory experiments, studies of ranavirus outbreaks in the natural environment are currently lacking. As part of a long-term wetland restoration study beginning in 2010, The Upper Susquehanna Coalition in collaboration with SUNY College of Environmental Science and Forestry created a network of hydrologically isolated ponds incorporating several pre-existing ponds at Heiberg Memorial Forest in Tully, New York. One target species of the restoration, the wood frog, has experienced several localized die-offs, and preliminary testing using PCR assay has verified ranavirus infection in all die-off sites. To identify factors influencing ecosystem-level susceptibility to infection, we are collecting data on tadpole populations, environmental conditions, water quality, and ranavirus prevalence during and between epidemics. We will use a modeling approach to understand which suite of biotic and/or abiotic variables are most influential in ranavirus outbreaks, to develop a predictive model that can be applied to other landscapes. Based on previous studies we expect temperature and hydroperiod to have highest predictive value. This will be especially applicable to future wetland restoration endeavors, as the Heiberg system incorporates both natural and constructed ponds and offers a unique opportunity to comparatively analyze disease outbreaks in each.