

Nest Structure, Thermal Properties, and Reproductive Performance in Prairie Warblers

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Abstract – Bird nests are built at a minimum to provide a structure that can safely hold the eggs and nestlings and protect them from predators. In cold climates, nests may be additionally designed to minimize heat loss, thereby increasing hatching success and nestling condition. We collected and measured nests of *Setophaga discolor* (Prairie Warblers) in western Massachusetts in 2009, and conducted a climate-controlled, nest-cooling experiment to determine how thermal properties are affected by nest characteristics for small, open-cup nesting birds. We then assessed if nests with better insulation properties resulted in any fitness benefits, and also tested if other nest characteristics affected nest survival or clutch size. We found that nest characteristics influenced their thermal properties, in that thicker, heavier, and larger nests had higher predicted equilibrium egg temperatures. Thicker nests were heavier and bigger in nest height and diameter, yet had smaller cup diameters, representing potential for opposing selection on open-cup nesting birds to provide adequate space inside the nest for young and concurrently insulate the eggs and nestlings. Although we did not observe any relationships with nest diameter and clutch size, we did observe a marginally significant trend that nests with smaller cup depths had smaller clutches, and both cup depth and clutch size significantly declined over the breeding season. Contrary to studies on cavity-nesting birds, we did not find any significant effects of nest thermal properties on hatching and fledgling success, nestling size, mass, or condition, or nest survival. These findings suggests that increased reproductive performance from nest insulation might not drive open-cup nest design for small passerines in temperate climates. Open-cup nests in temperate climates may have evolved to simply perform basic functions such as providing adequate space and support for the eggs and nestlings.

Sun-AM1-C-2

The Plant-Pollinator Monitoring and Restoration Movement: Is Citizen Science a Viable Approach?

Kerissa Battle (Community Greenways Collaborative, Bearsville NY and Portland State University, Portland, OR; communitygreenways@gmail.com)

Abstract - Pollinator gardens, phenology-monitoring programs, and a vast array of volunteer-monitoring initiatives devoted to tracking pollinators are examples of widespread action related to plant-pollinator research and habitat restoration. The combination of these initiatives is a potential game-changer for the plant-pollinator conservation movement and the interplay between data collection and restoration may create robust opportunities for adaptive management at large geographic scales. However, questions remain about the viability of these approaches. Are pollinator gardens actually supporting robust and diverse populations of pollinators? Do citizen scientists collect accurate phenological data? Are these approaches capable of creating scalable conservation networks in meaningful ways? These questions will be explored through primary research examples.

Sat-AM2-A-3

Landowner Decision-making in Response to Vernal Pool Regulations

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Abstract - The preservation and protection of small natural features poses unique challenges to ecologists and economists. Small natural features, such as vernal pools, are uniquely affected by development pressures; they are typically owned by a single individual who has complete discretion regarding development, while the ecological benefits of the feature are shared by a larger community. Heterogeneous town and landowner preferences toward state and federal regulations might affect land-use decisions made by both households and communities. In aggregate, these decisions might determine development spatial patterns and alter ecosystem benefits. Recent laws passed in Maine regarding the preservation of significant vernal pools highlight the need to study potential outcomes of vernal pool development. There are significant challenges facing researchers, however. One such challenge is to model decisions made by heterogeneous individual landowners and directly link those changes to broader environmental impacts. For this research, we implement a cutting-edge Monte-Carlo simulation that models land-use change over a 50-year time period for a generated town that has multiple land types, variably sized clustered parcels, variable within-parcel house location, vernal pool clustering, and a road network. Input variables include town reaction to regulations, individual opinions about vernal pool preservation, and town-wide growth decisions to develop currently unused land parcels. This complex system integrates with collected data to predict environmental responses to vernal pool development. Specifically, this integrates land-use changes with amphibian populations that are distributed across the landscape. Changes in amphibian populations, environmental conditions, and other ecological indicators are then used in a feedback loop within the decision-making process.

Sun-AM2-C-1

Ciliates in Altered Environments: Changes in the Microbial Community

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Abstract - Oil contamination impacts every harbor and port area worldwide, with oil spills, barge accidents, leaking underground fuel tanks, and drilling operations adding to the pollution load. The sensitivity of estuarine and marine communities to oil contamination is well established, especially for benthic organisms exposed long term to the presence of petroleum compounds in sediments. Biodegradation in natural ecosystems is complex, depending on the hydrocarbon mixture, the dynamics of the benthic environment, the nature of the microbial community, and a variety of environmental factors that influence microbial activities. This research project was designed to study the fate of ciliated protista exposed to chronic low-level oil pollution in stressed coastal habitats. Ciliates in oil-stressed environments show varying degrees of resilience, and this project was designed to provide a comparison of ciliate communities in oiled versus clean locations, based on microscopic observation of samples collected from the southernmost end of Prudence Island, located in Narragansett Bay. Findings include evidence of differentiation between the oiled and clean environments, including changes in species composition and relative abundance within each community, along with shifts in the number and type of metazoan predators and diatoms.

Sat-AM2-B-2

Effects of Forest Biomass Energy Production on Long-Term Northern Forest Structure and Composition

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Abstract - Federal and state governments in the Northeast US are actively engaged in assessing the potential role of forest biomass in meeting renewable energy goals. While current rates of timber harvest are generally sustainable, there is considerable pressure to increase the contribution of forest biomass for renewable energy. We estimated current harvest regimes for different forest types and regions across New York, Vermont, New Hampshire, and Maine using data from the Forest Inventory and Analysis Program. We implemented the harvest regimes in SORTIE-ND, an individual tree-based forest stand model, and simulated the effects of current harvest regimes and 5 additional harvest scenarios that varied by harvest frequency and intensity for 150 years. Forests were predicted to increase in adult aboveground biomass in all harvest scenarios in all forest type and region combinations; however, the magnitude of the growth varied dramatically (ranging between 3% and 120%). The variation in biomass growth can be largely explained by the disproportionately high harvest rates estimated for Maine as compared with the rest of the region. Despite steady biomass accumulation across the landscape, stands that exhibited older growth characteristics (defined as ≥ 300 metric tons of biomass/ha) were rare (8% or less of stands). Intensified harvest regimes had little effect on species composition, due to a predominance of partial harvesting that contributed to the prevalence of later successional species over time. Forest biomass can represent a viable component of renewable energy policy in the Northeast; however, tradeoffs between biomass stock and supply must be considered.

Sat-AM2-C-1

Immunogenetic Variation and Disease Susceptibility in Endangered Red Wolves and Sympatric Coyotes

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Abstract - Infectious diseases pose a significant threat to global biodiversity and may contribute to extinction events. Endangered populations are particularly vulnerable to disease given they are often inbred and may lack the genetic variability needed to combat pathogens. Thus, identifying factors that influence disease susceptibility, such as associations between immune genes and parasite prevalence, can help predict risk for endangered species like *Canis rufus* (Red Wolf). In this study, we evaluated if immunogenetic variation influenced disease susceptibility in endangered Red Wolves and sympatric *Canis latrans* (Coyote). We assessed both innate (Toll-like receptors [TLR]) and adaptive (major histocompatibility complex [MHC]) immune gene variation and collected immunocompetence and parasite data to evaluate if TLR or MHC variation influenced immune response or disease susceptibility. Red Wolves had lower immunogenetic variation than Coyotes; however, we detected Coyote introgression that increased Red Wolf genetic variation over time. Coyotes had a more species-rich parasite community than Red Wolves, suggesting they could harbor more parasites and act as a disease reservoir. Heterozygosity influenced immune response, but strength and direction of associations varied by gene. Our study suggests disease may not currently be a major threat to Red Wolves, but given every individual is important, low immunogenetic variation and increased susceptibility to pathogens that reduce fitness, result in occasional deaths, or even moderately affect population growth may contribute to extinction.

Sat-PM1-A-2

Effect of Grazing Regime on Grassland Breeding Bird Abundance

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Abstract - Grassland breeding bird abundances in New York State have been following a national downward trend as land-use changes degrade, destroy, and fragment suitable habitat. Many studies quantify grassland bird abundance over open, grassy agricultural landscapes, but have generally excluded pastures and grazing impacts on habitat from their analysis due to the assumption that grazing stresses grassland birds through overgrazing and intense trampling. This study aims to quantify bird abundance on several pastures that are managed differently including continuously grazed, minimally rotated, and holistically grazed pasture. I hypothesize that grassland bird abundance varies systematically with pasture management approach. I obtained grassland bird abundance from circular point-counts performed on 10 different farms consisting of 30 pastures. Further, I measured a set of vegetation and environmental variables to characterize the available habitat on each pasture. Preliminary data analysis suggests that holistically managed pastures have 1.9 and 3.7 times higher abundances of grassland birds than minimally rotated or continuously grazed pastures, respectively. These results indicate that there are strategies that can be employed on farms that promote bird habitat and may therefore have a positive influence on grassland bird metapopulations in New York State.

Sat-AM1-A-1

Predicting Winter Mortality of Hemlock Woolly Adelgid in Connecticut

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Abstract - *Adelges tsugae* Annand (Hemlock Woolly Adelgid [HWA]) is a serious exotic insect pest from southern Japan which attacks susceptible natives *Tsuga canadensis* (L.) Carriere (Eastern Hemlock) and *Tsuga caroliniana* Engelman (Carolina Hemlock). Since its first detection in the early 1950s in Virginia, HWA currently infests 20 eastern states and southern Ontario, Canada. It is a major factor causing the widespread decline and mortality of hemlocks in riparian and other ecosystems in eastern North America. The unique biology of HWA includes a sistens generation that actively feeds in the fall, winter, and spring, making it susceptible to winter extremes. Connecticut has been infested with HWA for 30 years and HWA winter mortality has been intensively sampled in all 3 climate divisions of Connecticut from 2000 to 2015. Connecticut's juxtaposition between the Mid-Atlantic States and northern New England, with its northwest interior highlands approximating the southern range of northern forests, its warmer coastal sections, and the lower Connecticut River Valley, was the ideal geographically and climatically diverse setting for this 15-year field study that assessed the role and impact of winters on HWA populations. Predictive relationships indicated that minimum daily winter temperatures, the number of subzero days (base = -17.8 °C [0 °F]) and a new variable, negative degree days (NDD), that combines the number of subzero days with subzero cold intensity are highly significant determinants of HWA winter mortality patterns. These relationships are best described and analyzed within climatic divisions as sigmoid relationships. Although Connecticut is relatively small in size, there is an average difference of 13 °C in the winter between the northern hill regions and the southern coastal plain, which is moderated by maritime influences. Coastal HWA appeared to be less cold hardy, and interior HWA populations developed cold adaptation in the 15-year study. Analyses of the 2014 polar vortex effects on HWA mortality showed that a single brief low temperature event was sufficient to kill 89-96% of HWA. Current data predict that 90% HWA mortality will occur when minimum daily temperatures reach -24 °C in Division 1 (Northwest), -22.4 °C in Division 2 (Central), and -21.2 °C in Division 3 (Coastal).

Sat-AM1-B-1

Forest Response to Winter Climate Change: Lessons Learned from the Hubbard Brook Experimental Forest

Lynn Christenson (Vassar College, Poughkeepsie, NY; lychristenson@vassar.edu)

Abstract - Climate change is understood to have many potential impacts on ecosystems, stemming from increased temperatures and alterations in precipitation patterns. Equally important to our northern temperate forest ecosystems are changes in winter climate; more specifically, changes in snow timing, depth, and duration. Snow is an important soil temperature regulator over the course of the winter season and we have been investigating how changes in snow condition impacts a suite of ecosystem responses at the Hubbard Brook Experimental Forest for the past 20 years. We have found a number of important responses and links between all components of a forested system. These responses include alterations in microbial activity and community composition, increased export of NO₃- to streams, increased N gas flux, changes in soil carbon storage, changes in decomposition rates and subsequent nutrient availability, along with increases in fine root damage and mortality and changes in invertebrate community structure. All of these responses will lead to alterations in both the resilience and productivity of our future forests.

Sat-AM1-B-3

The Role of Animals in Ecosystems—From Moose to Moths: How Animals Influence Nutrient Dynamics in a Northern Hardwood Forest

Lynn Christenson (Vassar College, Poughkeepsie, NY; lychristenson@vassar.edu)

Abstract - Animals are often considered inconsequential regulators of nutrient cycling, with some notable exceptions (large herbivore control, insect outbreaks, and earthworm activity to name a few). But how important are all animals at regulating ecosystem processes that can significantly alter nutrient dynamics? And how will climate change influence these interactions? This study specifically investigated how snow depth and soil freezing will influence activity of large herbivores and soil invertebrates, and how this activity feeds back to decomposition and nutrient dynamics. We used short-term experimentally manipulated plots, a natural climate gradient, and long-term weather data at Hubbard Brook to evaluate how changes in winter climate will influence ecosystem processes in this northern hardwood forest. Changes in snow depth led to altered browsing behavior in *Alces alces* (Moose), where *Abies balsamea* (Balsam Fir) was more heavily browsed under low snow conditions compared to *Acer saccharum* (Sugar Maple) or *Viburnum* shrubs. Plants that were mechanically browsed to simulate Moose feeding triggered differential plant response and nutrient uptake, where Moose fecal nitrogen was more available to Balsam Fir than Sugar Maple or *Viburnum* shrubs, while biomass production was reduced. Decomposition rates were also slowed or reduced under soil-freezing conditions. Soil invertebrates, important regulators of decomposition and nutrient cycling, showed higher diversity in sites where winter frost depths were shallow, compared to sites with deeper frost. Total abundances of soil invertebrates were not different between shallow and deeper frost sites. There was a potential link to changes in mineralization and nitrification rates, where sites with high freezing had lower nematode abundances and sites with lower freezing had higher nematode abundances while both types of sites had no measurable differences in microbial biomass. Nematodes may be an important regulator of N-cycling rates in soils exposed to soil freezing via reductions in bacterial feeding nematodes. These results indicate that complex relationships exist between organisms, ecosystem processes, and changing climate, and that animals may modify a systems response to altered winter climate regimes.

Sat-PM2-A-1

Monitoring the Effects of Dam Removals in the Mill River, MA: 2015 Freshwater Mussel Survey Results

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Abstract - The Taunton River, a ~500-mi² watershed in southeastern Massachusetts, hosts one of the largest river herring runs in New England and was designated Wild and Scenic in 2009. While the main-stem Taunton River is free flowing, many tributaries are blocked by obsolete dams. As part of a larger effort to remove barriers, restore habitat, and improve natural populations throughout the watershed, the Mill River Restoration Partnership, a collaboration of government agencies, non-profit organizations, and others, is working to remove the dams along the Mill River. Two dams have been removed, and a fishway has been installed at a third dam since 2012; one dam remains to be removed. The Partnership is dedicated to monitoring the impacts of these dam removals on populations and habitat of fish, mussels, and other invertebrates. As part of this effort, the presented study will assess the effects of dam removals on the freshwater mussel assemblages, macroinvertebrate assemblages, and stream habitat in the Mill River Watershed. In particular, the effects on *Anodonta implicata* (Alewife Floater), *Lampsilis nasuta* (Eastern Pondmussel, MA Special Concern), and *Lampsilis ochracea* (Tidewater Mucket) are being documented. The objectives of the presented study are to: (1) qualitatively survey freshwater mussels, (2) quantitatively survey mussels, (3) characterize habitat, and (4) sample freshwater invertebrates at the quantitative mussel survey locations, both before and after the final dam removal. The summer 2015 qualitative mussel survey entailed surveying ~17 km in the Canoe, Snake, and Mill rivers and resulted in 77 qualitative sampling stations and the documentation of 5 species of freshwater mussels represented by 2942 individuals over a combined active search time of 1756 minutes. The overall CPUE was 1.68 individuals/minute with an average CPUE of 1.57 individuals/minute per station. The relative abundance of the 5 species was *Elliptio complinata* (Eastern Elliptio; 89%), *Lampsilis radiata* (Eastern Lampmussel; 10%), Alewife Floater (0.5%), Eastern Pondmussel (0.4%), and *Pyganodon cataracta* (Eastern Floater; <0.1%). Overall, the Eastern Pondmussel was observed at 6 stations represented by 11 individuals. Meanwhile, the target species Alewife Floater was observed at 9 stations and represented by 16 individuals. We will discuss the implications of these findings and future monitoring plans.

Sat-PM2-C-3

Sound Maps of Singing Insects at Seven Hudson Valley Orchards

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Abstract - Sound surveys provide a non-invasive, geographically specific way of surveying certain components of biodiversity. GPS-tagged sound recordings taken in grids on portions of 7 Hudson Valley orchards were used to determine the call strength of different species of insects (Orthoptera) at those points. By making call strength analogous to elevation and using interpolation to generate surfaces, sound maps were created, providing orchardists with a visualization of an aspect of their orchard ecology. Sound maps for 10 different species, 6 of which were present in at least 3 of the orchards, were made and revealed that different species seemed to favor specific habitats within the orchards. Species believed to include *Allonemobius allardi* (Allard's Ground Cricket) and *Oecanthus celerinictus* (Fast-calling Tree Cricket) generally preferred forests or field edges, while the *Neoconocephalus robustus* (Robust Conehead) favored the relatively longer grasses within the orchards. Orchardists seemed to be intrigued with these maps and believed they provided a useful way to visually present aspects of orchard ecology to their consumers. This ability of sound maps to display "complex" information in an appealing and intuitive way is one reason we favor them.

Sat-PM1-B-1

Citizen Science with the Caterpillars of Oak Trees: Forest Food Webs on the World Wide Web

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Abstract - Citizen science programs provide unique opportunities for amateur naturalists to participate in the scientific process by making simple observations in the field and reporting these observations using web-based applications. Citizen science has exploded in popularity and is now becoming a powerful tool for tracking the phenology and distribution of plants and animals. Moth caterpillars are one of the most diverse groups of herbivores on deciduous trees in the Northeast, and these caterpillars are a critical component of forest food webs. This talk will present a citizen science program that has been developed using large-scale, food web data on forest caterpillar communities in Connecticut forests. Combined with feedback from teachers and other environmental educators, I have developed a program that instructs students on common food-web interactions that affect caterpillars and provides identification tools for the most common species found on oak trees. Using web-based data generated by students and amateurs, this citizen science project will track changes in caterpillar food-web interactions that may be caused by invasive species and global climate change.

Sun-PM2-A-3

The Role of Herbivore Community on Plant Secondary Chemistry and its Effects on Caterpillar Diet-Breadth

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Abstract - In Southern New England's forests, larval Lepidoptera are among the most prevalent herbivores in terms of both abundance and diversity. Forest caterpillars are a vital component of the forest food web as the dominant insect folivore on many tree species and as a food source for migratory birds. Due to the prevalence of caterpillars and other leaf-chewing herbivores, plants have evolved defensive chemical profiles that, when induced, target specific guilds of herbivores, like caterpillars. It has been observed that the diet breadth of caterpillars (i.e., whether they are specialists on one host plant group or generalists on many host plant groups) contributes to caterpillar susceptibility to plant defenses. Phenolic compounds, like tannins, have proven especially effective in deterring generalist-caterpillar feeding on forest trees. However, recent research in plant hormone chemistry has shown that the activation of phenolic defenses is inhibited by sap-feeding herbivores. In this study, we examined if sap-feeding on *Quercus alba* (White Oak) by membracids (tree-hoppers) disrupt plant-induced defenses towards chewing caterpillars. Through field manipulations, this study demonstrated that the presence of membracids is positively correlated with generalist caterpillar abundance, supporting the prediction that these sap-feeding herbivores disrupt plant defenses against caterpillars. Furthermore, we used bioassays of generalist and specialist caterpillars to test the relative growth responses caterpillars for both dietary generalists and specialists. Our results suggest that generalist caterpillars are in fact more susceptible to induced defenses, but the presence of sap-feeders and the changes they cause in plants undermines the effectiveness of these induced defenses.

Sun-PM2-A-2

Revisiting the Paleontology of Nantucket and Martha's Vineyard

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Abstract - The paleontology of Nantucket and Martha's Vineyard was the subject of much interest in the mid-late 1800s and early 1900s. Noted geologists and paleontologists, such as Joseph Cushman, Charles Lyell, and Nathaniel Southgate Shaler published on the fossils found on the islands. Since the early 1930s, there have been only a handful of publications on the paleontology of the islands as research interests have shifted to the far away and more exotic fossils. Although many of the localities ranging from Cretaceous to Pleistocene age (100 million to less than 1 million years ago) are still accessible, only a small amount of the fossil material is present in the local natural history collections. Since 2011, our research group has been working to collect material from the Pleistocene deposits at Sankaty Head on Nantucket. Storm erosion has made it difficult to locate previous collecting localities and at times to access the fossiliferous layers. Work at Sankaty Head has produced 2 possible Terebratulid brachiopod taxa that had not previously been documented in the paleontological literature. The fossil assemblage mostly consists of mollusks (bivalves and gastropods) with an abundance of barnacles from the genus *Balanus*. These taxa may help us to understand the paleobiogeography of the island and give a better understanding of the paleoecology of this Pleistocene age fauna. In 2015, we had the opportunity to survey the geologic exposures at Gay Head Cliffs and other locations on Martha's Vineyard. There is more work to be done on both islands, but it is our hope that this work will result in an updated account of the paleontology of Nantucket and Martha's Vineyard.

Sat-AM2-D-1

Can Monitoring Networks Be Valuable in Ecosystem Services Data Collection?

Jamie Deppen (Vassar College, Poughkeepsie, New York; jadeppen@vassar.edu)

Abstract - The Environmental Monitoring and Management Alliance (EMMA) is comprised of scientists and land managers from nature preserves and research institutions. The partnership first formed in 2013 to standardize monitoring protocols for monitoring projects that were occurring independently at different sites and to share information on land management in Southeastern New York State. A region-wide survey of land managers confirmed an expected response that land managers within EMMA's region struggle to find funding and to have sufficient personnel to perform effective management. Likewise this was echoed in a recent conference on the challenges of sustaining conserved lands, as funding was listed as a major challenge in the maintenance of lands. Though some services provided by conserved lands can be more easily valued (e.g. recreation), there is a desire to build community support for land trusts by demonstrating the value their lands provide through ecosystem services (e.g. improved water quality). The ability to demonstrate the effect of different land-management techniques on provided ecosystem services may also affect support for land management. Despite interest in ecosystem services, however, local primary data is rarely easy to find and is necessary to determine more accurate estimates of services. This talk will introduce the EMMA collaboration and explore if a monitoring network may be useful in collecting local data on ecosystem services.

Sat-AM2-A-1

Attitudes and Perceptions of Deer Management in Suburban Boston

Michael D. Devito (Brandeis University, Waltham, Massachusetts; devitom@brandeis.edu), Emily Silver Huff (University of Massachusetts Amherst, Amherst, MA; silver@eco.umass.edu), and Brian Donahue (Brandeis University, Waltham, MA, bdonahue@brandeis.edu)

Abstract - Communities in the United States have experienced a large and growing *Odocoileus virginianus* (White-tailed Deer) population. Residents in these communities may enjoy encounters with White-tailed Deer, but they also are subject to problems with deer such as car collisions, garden damage, and Lyme disease. In the suburbs of Boston, deer are increasingly abundant, and many towns have elected to adopt organized hunting programs. Two of these towns are Weston and Sudbury, which we have included in our survey. For town-level management of White-tailed Deer to succeed, managers must first understand residents' awareness of management strategies and attitudes towards wildlife, recreation, and hunting in their town. This project was developed to assist town governments and area natural resource management non-profits in determining how to manage White-tail Deer in the leafy first-tier suburbs of Boston, MA. The technical aspects of deer control must be balanced with socially acceptable solutions that minimize conflict between different stakeholders in the region and can gain a broad consensus. The West Suburban Conservation Committee (WSCC) Deer Survey will be used to survey residents of 5 towns (Weston, Wayland, Sudbury, Lincoln, and Concord). Here, residents are confronted with the benefits and the problems associated with a high White-tailed Deer population. The survey will focus on attitudes, perceptions, and behaviors of individuals related to recreational forest use and deer management.

Sun-AM2-A-3

Haudenosaunee (Iroquois) Plant Practices and Indigenous Landscape Restoration in the Northeast

Jessica Dolan (Department of Anthropology, McGill University, Montreal, QC, Canada; liftingupleaves@gmail.com)

Abstract - Haudenosaunee (Iroquois) plant knowledge is not often spoken about as a living, vital, northeastern Indigenous ethnobotanical tradition. Drawing from the last 7 years of exchanging knowledge with Haudenosaunee traditionalists and plant enthusiasts, I will offer some examples of cultural persistence of seasonal wild plant use, comparing contemporary practices with James Herrick's collected notes of the 1970s, and meaningful plants in the Haudenosaunee oral tradition. Harvesting plants for food, medicine, and traditional crafts, and planting heirloom food species, is a robust part of Haudenosaunee identities and cultures, as it is for many northeasterners of all backgrounds. Haudenosaunee traditional philosophy mandates that human beings recognize and appreciate plants as part of human stewardship responsibilities. Learning from Haudenosaunee practices of fostering cultural relationships between humans and plants can enable people of all backgrounds to re-envision historical Indigenous landscapes to strengthen participation and collaboration in stewarding and restoring northeastern landscapes for ecosystem health in the future.

Sun--A-4

Sustainable Working Landscapes: Wildlands, Woodlands, and Farmlands

Brian Donahue (Brandeis University Environmental Studies Program, Waltham, MA; bdonahue@brandeis.edu)

Abstract - New England has been witnessing the growth of a conservation vision that brings together the strands of sustainable resource production and the provision of ecosystem services by natural systems, both of which have deep roots in the traditions of the region. This synthesis has recently been given structure by the publication of a series of visions on the future of New England forest and farmland conservation featuring "sustainable working landscapes", where actively managed, productive woodland and farmland play an equal role with wilder natural areas. This talk summarizes that vision, explores the challenges and opportunities it presents, and suggests an active role for ecological research in supporting integrated stewardship of the landscape at the local community level. Topics explored include long-term monitoring of sustainable forestry, addressing the spread of *Adelges tsugae* (Hemlock Woolly Adelgid), monitoring the impact of deer browse, maintaining habitat for open-land species, and monitoring water quality and soil carbon under various land management regimes.

Sun-AM2-A-1

Patterns in Wood Frog Tadpole Body Condition and Survival across an Urbanization Gradient

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Abstract - There are conflicts between vernal pool conservation and anthropogenic disturbance, notably urbanization, in municipalities throughout Maine. We have little information on how urbanization may contribute to population declines of vernal pool-breeding amphibians. Examining relationships between amphibian body condition, survival, and urbanization can lead to better understanding of the landscapes necessary to maintain healthy populations. During 2014–2015, we collected body-size and survival data on *Lithobates sylvaticus* (Wood Frog) tadpoles at 41 vernal pools in and near Bangor, ME. Egg mass and embryo counts and 3 consecutive days of dip-netting prometamorphic tadpoles were used to estimate the difference between tadpole abundances throughout the season. During bi-weekly tadpole surveys, we measured body length, mass, and volume and recorded developmental stage, and injuries. We quantified within-pool vegetation, water characteristics, estimated abundance of predatory large insects, and percent impervious surface within 990 m of pools. Using multivariate techniques, we reduced the number of body-size variables. Resulting body-size variables and estimated larval survival were modeled based on site characteristics, and AICc model averaging was used to interpret the influence of site characteristics. Results suggest possible interactions of road salts, tadpole competition, and insect predators.

Sun-AM2-C-2

7500 American Chestnut Trees and Counting: The Research that Ate my Summer in 2015

Richard Gardner (Shartlesville, PA; rtgardner3@yahoo.com)

Abstract - During the summer of 2015, in reaction to the questionable concept I had continually heard about the American Chestnut (*Castanea denitata*) going extinct, I decided to do a census on the Appalachian Trail from the Rausch Gap to the Lehigh Gap and other local trails. Over 38 days were spent on the census using a GPS-equipped camera, with many more days gathering data on American Chestnut reproduction and how the Chestnut Blight (*Cryphonectria parasitica*) affected the trees. I walked a total of over 80 miles of Appalachian Trail along with at least another 40 miles on other trails. I found more than 7500 trees of various sizes from seedlings to mature adults along 2 trail systems separated by about 30 miles. In 3 separate locations, I found a total of 44 trees bearing seeds. The limiting factor in American Chestnut reproduction appeared to be access to direct sunlight. The obvious conclusion I derived from this time in the field is that the American Chestnut is coming back without our interference. Attempts to hybridize it with non-native chestnut species to make “blight resistant” trees are unnecessary and may be detrimental to the ecology of the Appalachian forest. This study will be continued in 2016 by walking additional trails.

Sun-PM2-C-3

When the Birds Go Unheard: Highway Noise Disrupts Information Transfer Between Bird Species

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Abstract - *Baeolophus bicolor* (Tufted Titmouse) have a large number of songbird species eavesdropping on their alarm calls, which alert eavesdroppers to the presence of high-risk avian predators, such as hawks or owls. Highway noise may disrupt detection of Titmouse alarm calls by these eavesdroppers, potentially increasing the eavesdroppers' risk of predation or general sense of danger. In north-central Florida natural areas, we investigated the effect of highway noise on the detection of these alarm calls by common information consumers: *Cardinalis cardinalis* (Northern Cardinal). Playing back Titmouse alarm calls in noisy versus quiet areas, we were able determine behavioral response or lack of response by Cardinals. We found that Cardinal response rates dropped drastically at relatively low levels of background noise (≥ 47 dBA). To our knowledge, this is the first study to demonstrate road noise blocking information transfer between species, suggesting implications for soundscape conservation in managed natural areas that host species that are sympatric to birds in the family Paridae (titmice, tits, and chickadees).

Sat-PM1-B-3

An Assessment of Movement Patterns and Basking Habitat Use for the Northern Red-Bellied Cooter in MA

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Abstract - The Massachusetts population of *Pseudemys rubriventris* (Northern Red-bellied Cooter) was listed as a federally endangered species in 1980 when only 200 individuals were estimated to remain in MA. At the northern extent of its range, basking-habitat availability may be a critical component of maintaining viable populations. Furthermore, as the need to thermoregulate varies seasonally in response to changing environmental and biological factors, shifts in activity areas may occur due to migration to and from optimal basking sites. During the summer of 2015, we quantified basking-site usage and movement patterns across freshwater ponds located within a matrix dominated by fragmented forest lands, residential areas, and cranberry bogs in Plymouth County, MA. At each focal pond, we conducted visual surveys via kayak during emergence (April and May), nesting (June) and post-nesting (July and August) seasons and recorded basking sites used by Northern Red-bellied Cooter during each visit. Within each season, we compared the characteristics of basking objects (e.g., size, orientation, height above water) with a set of unused, potential basking objects using generalized linear models. Northern Red-bellied Cooter were shown to tolerate a wide variety of basking-object characteristics, but selected more frequently low-sloping, southerly oriented basking objects located in predominantly open-water habitat with an average water depth of up to 1.5 m. Forty-seven percent of total basking observations occurred during the last 2 weeks of May, while 25% of species movement was detected during the first 2 weeks of May. We used our results to describe the optimal characteristics of basking objects and evaluate shifts in basking behaviors and seasonal distribution across multiple spatial and temporal scales as a result of changing weather conditions, seasons, and water levels. This assessment will be used to inform future management actions to improve Northern Red-bellied Cooter habitat and detection in Massachusetts.

Sun-PM2-B-3

Using Mark–Recapture Methodology to Estimate Adult Lifespan of the Robber Fly *Lasiopogon slossonae* (Diptera: Asilidae) in a Riparian Zone near Lake Placid, New York

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Abstract - Previous studies of selected robber fly species have documented general behavioral traits for these predaceous insects, however, no such studies have been conducted for the spring-specialist robber fly species *Lasiopogon slossonae*. To better understand the behavior and adult life cycle of *L. slossonae*, we conducted a mark–recapture study along the west branch of the Ausable River in Lake Placid, NY. Individual robber flies were captured, anesthetized using carbon dioxide, marked with a unique dot pattern of acrylic paint, released, and observed during a 2-month period. 240 *L. slossonae* adults were marked, of which 89 were re-sighted at least once. The average number of days between sightings was 7 days, whereas the maximum number of days between sightings was 23 days. Adult flies were first observed on June 4 and were last observed on July 20, with peak adult emergence reached on June 16, suggesting a front-loaded adult-emergence season of 47 days. Similarly, mating pairs were first observed on June 4, the first day of adult emergence, and were last observed on July 17, with the frequency of mating pairs declining rapidly by the end of June. Ten confirmed *L. slossonae* prey specimens were identified, including black flies and balloon flies. Our results offer new insights into the adult lifespan, prey selection, emergence pattern, and mating behavior of this species, an important predator of pest insects such as black flies.

Sat-AM1-D-1

Does Floristic Diversity next to Kitchen Gardens Influence Wild Bee Visits?

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Abstract - Wild bee are ecologically and economically valuable as pollinators. They enhance and maintain biodiversity in both large-scale commercial agriculture and in small-scale kitchen gardens. Despite their economic importance, wild bees are faced with increasing threats of climate change, habitat fragmentation, land-use intensification, and pesticide use. Therefore, there is a pressing need for research on patterns of wild bee communities. We surveyed 12 kitchen vegetable gardens in St. Lawrence County. We hypothesized that wild bee diversity would be the greatest in areas with greater adjacent floristic diversity and at the point in the summer when the most plants flower. Additionally, we hypothesized that there would be no significant difference among bee species found in cultivated kitchen gardens and those found in uncultivated regions surrounding the gardens. We used pan traps and floristic surveys during the summer of 2015. We trapped 100 species in at least 20 genera of wild bees. There was no significant difference ($P > 0.05$) in the bee species trapped both within and outside of kitchen gardens. However, there is a pattern indicating the importance of floristic diversity both within and outside a kitchen garden for attracting wild bees. This study expands upon previous research regarding bee diversity and contributes to the much-needed compilation of scientific baseline information concerning plant/pollinator interactions and monitoring in St. Lawrence County.

Sat-AM1-C-1

Current state of the All Taxa Biodiversity Inventory (ATBI) project at the Boston Harbor Islands National Recreation Area

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Abstract - Beginning in 2005, Harvard University began collaborating with the National Park Service and others in the Boston Harbor Islands Partnership to conduct an All Taxa Biodiversity Inventory (ATBI) at Boston Harbor Islands National Recreation Area, Massachusetts. Like most ATBIs, our inventory had three complementary objectives: (1) to catalog insect biodiversity in the park, (2) to educate and excite the public about local biodiversity, and (3) to use biodiversity data to inform park management. An important component of this survey focuses on the diversity of insects and their arthropod relatives, which comprise what renowned entomologist and Harvard professor emeritus Dr. E.O. Wilson has affectionately referred to as the “microwilderness”. Using pitfall and malaise traps, bee bowls, nets, beating sheets, and UV lights, 76,839 specimens representing 1,732 species were collected, including more than 700 species of beetles, 170 species of native bees, 51 species of ants, and 19 species of millipedes. Among the identified species, many new state and regional records were documented, as well as new introductions to the United States. Other focuses of the ATBI project are marine invertebrates (189 species identified), mammals (10), amphibians (1), reptiles (3), vascular plants (521, of which 229 alien), lichens (175), bryophytes (70), and fungi (70+ and ongoing). The education and public outreach component includes a curriculum-based program that is in active use by park rangers and partners, a full gallery of images in an online database, eye-catching posters of various groups, an award-winning PredatOR-Prey playing card game, fold-out field guides to commonly encountered “Creatures of the Microwilderness”, and observer cards for ants, bees, and frogs (which are available through the website of Encyclopedia of Life).

Sat-PM1-D-1

Analyzing the Effect of DBH on Rate of Progression of Beech Bark Disease in *Fagus grandifolia*

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Abstract - In the northeastern United States *Fagus grandifolia* (American Beech) is currently experiencing widespread decline in population health as a result of the multi-pathogenic Beech Bark Disease (BBD). A limited number of studies have indicated that *F. grandifolia* does not appear to be susceptible to infection at smaller diameters. We have found this to not be the case in Central Vermont, with a study sample of 200 trees. We hypothesize that the appearance of reduced susceptibility, is not in fact an absence of the disease in the smaller individuals. Rather, we propose that the size of trees influences the rate at which BBD progresses, with larger trees having an increased rate of disease progression. We will assess this hypothesis through statistical analysis of 10 years of monitoring data of 200 individual *F. grandifolia* in western central Vermont. Our conclusions will inform land managers and foresters as to how to best approach management of infected individuals with consideration to disease progression as a correlate of size.

Sun-PM2-C-1

Baseline Assessment of the Diamondback Terrapin Population at Allens Pond Wildlife Sanctuary

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Abstract - *Malaclemys terrapin* (Diamondback Terrapin) is an important estuarine predator and may be a reliable indicator of ecosystem health. This species is currently listed as threatened in Massachusetts, and Allens Pond Wildlife Sanctuary (Westport, MA) is one of few sites known to support a population. However, no rigorous studies have been conducted to evaluate the conservation status of this population. The objectives of this study were to determine the size and structure of the terrapin population at Allens Pond, identify terrapin nesting areas, and assess predation pressure on the population. Baited hoop trapping and hand collection of terrapins in several regions of Allens Pond were conducted between July and August 2015. Data include 28 captures of 23 mostly juvenile individuals with a sex ratio not significantly different from 1:1. Evidence from track plates and trail cameras along outlying forest cover and known nesting habitats suggest low local predation pressure, as deer, rabbits, and field mice were numerous, whereas few carnivores were observed. These data provide a valuable baseline reference for future research at Allens Pond and comparable sites, and for the development of conservation and management strategies to reduce the risk of local extinction of *M. terrapin*.

Sun-AM 2-B-1

Managing Freshwater Mussels During Dam Removal: A Case Study on the Nissitissit River

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Abstract - Dam removal is an important and effective tool for restoring hydrologic and geomorphic processes, and increasing passage for native aquatic fauna. However, local losses to rare species are not always weighed against the long-term benefits of stream restoration. The literature surrounding dam removals in habitat of freshwater mussels (Bivalvia: Unionoida) suggests conflicting opinions regarding the benefit of dam removals to this taxa, which is among the most-imperiled faunal groups worldwide. In September 2015, the Millie Turner Dam on the Nissitissit River (Pepperell, MA) was removed because of dam safety concerns, to increase flood resiliency, and to restore stream connectivity and fish passage. The dam previously separated 2 populations of the state endangered *Alasmidonta varicosa* (Brook Floater), and 3 other species of conservation concern: *Strophitus undulatus* (Creeper), *Alasmidonta undulata* (Triangle Floater), *Margaritifera margaritifera* (Eastern Pearlshell). Prior to the removal of the dam, Massachusetts Division of Fisheries and Wildlife (MDFW) surveyed presence, abundance, and habitat use of the 4 target mussel species at sites below the dam, within the influence of the impoundment, and upstream of the impoundment to establish a population and habitat baseline. During the dam removal, MDFW staff and volunteers translocated more than 200 individuals of the target species to refuge sites upstream of the impoundment. A comparison is planned for long-term monitoring of target mussel populations and changes to stream habitat following dam removal, in anticipation of further informing management practices for freshwater mussels during dam removal.

Sat-PM2-C-4

Population Genetics of New York City Coyotes

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Abstract - *Canis latrans* (Coyotes) have increased their range across the United States and are now inhabiting the most densely populated cities. In order to determine how Coyotes are moving across the highly urbanized landscape of New York City, we collected scat samples from several parks within the city. We extracted DNA from the samples and used microsatellite markers to create individual genotypes. We then examined the relatedness between individuals in order to ascertain the presence of family groups and to estimate individual movement patterns. We found evidence of first-order relatedness within and between parks, implying the presence of several family groups, as well as migration and gene flow of Coyotes within New York City.

Sat-PM1-A-4

Genetic Survey of Coyote (*Canis latrans*) Expansion and Hybridization in the Eastern US

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Abstract - Traditionally, introgression from a closely related species is often an underappreciated source of adaptive genetic variation. However, *Canis latrans* (Coyote) have recently undergone a substantial eastward range expansion, which was likely facilitated by the adaptive introgression of genes from closely related canid species, wolves. The primary objective of this research is to identify the genetic consequences of range expansion and hybridization events. We have genotyped 467 Coyotes from 5 US States at 10 microsatellite loci and explored genetic structure and dispersal through a Bayesian framework. We identified a distinct separation between the northern and southern Coyote populations, with evidence of moderate gene flow between them. We discuss these results in the context of divergent hybridization events and dispersal patterns.

Sat-PM1-A-1

White-nose Syndrome: An Update on Bat Status in the Northeast and Beyond

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Abstract - White-nose syndrome is a devastating disease resulting in extensive mortality of hibernating bats in North America. First discovered in upstate New York in 2007, the disease has since spread rapidly to 30 states and 5 Canadian provinces, killing millions of bats. The cause is an exotic fungus, *Pseudogymnoascus destructans*, likely originating in Eurasia. Since the disease has been present for approximately a decade, clear patterns have emerged on the magnitude of threat to hibernating bats. Degree of impact varies tremendously across species, with *Corynorhinus townsendii virginianus* (Virginia Big-eared Bat) least affected to *Myotis septentrionalis* (Northern Long-eared Bat) and *Perimyotis subflavus* (Tri-colored Bat) on the other end of the spectrum (exhibiting losses greater than 95% in areas where WNS has persisted). Early research was aimed at understanding the mechanisms of the disease, and although there is more work to be done in that regard, we have a relatively clear idea of how the fungus affects bats. Recent research has focused on developing effective treatments with a number of efforts at or close to the field-trial stage. Other management efforts have been directed at protecting summer and winter habitat for remaining bats although the potential for negative effects is greater at hibernation sites.

Sat-PM2-B-1

Comparative Population Structure of Vernal Pool Amphibians Across a Changing Landscape

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Abstract - Seasonally inundated wetlands (i.e., vernal pools) are small but ecologically important features in the northeastern United States. With vernal pools occurring throughout the region's mixed woodland, agriculture, and urban landscapes, obligate species are particularly susceptible to the effects of landscape fragmentation. We have used microsatellite genetic data from over 90 populations of *Lithobates sylvaticus* (Wood Frog) and *Ambystoma maculatum* (Spotted Salamander) collected throughout Maine to assess interpopulation connectivity across a heterogeneous landscape. These vernal pool obligate amphibian species are generally philopatric to their natal sites, resulting in metapopulation structuring centered on vernal pools. We evaluated 2 hypotheses: (1) at local scales, natural (e.g., rivers) and anthropogenic (e.g., roadways) features will coincide with discontinuities in genetic structure, and (2) at broad scales, genetic structure will follow an isolation-by-distance pattern with a stronger effect for the more sedentary Spotted Salamander. Preliminary Bayesian clustering and resistance surface analyses indicate barriers to gene flow commonly coincide with both natural and anthropogenic landscape features, although the effect is not uniform across similar features (e.g., interstate highways). Although both species showed significant isolation-by-distance relationships (Wood Frogs: Mantel $r = 0.12$, $P < 0.001$; Spotted Salamanders: Mantel $r = 0.07$, $P < 0.001$), our results indicate greater genetic differentiation over short distances (<20 km) for Spotted Salamanders than for Wood Frogs. However, contrary to our hypothesis, over larger distances (>200 km) greater genetic differentiation is more commonly observed for Wood Frogs than Spotted Salamanders. These results will contribute to a coupled natural and human systems model to improve vernal pool conservation across urbanizing landscapes.

Sun-AM2-C-4

Functional Traits Determine Heterospecific Use of Risk-related Social Information in Forest Birds of Tropical Southeast Asia

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Abstract - In birds and mammals, mobbing calls constitute an important form of social information, known to widely attract heterospecific species. While such attraction is generally considered to reduce future predation risk for responding species, there is surprisingly little empirical evidence. One way to test this link involves testing the relationship between species' attraction to mobbing calls and the functional traits defining their vulnerability to predation risk. Here we combine bird community surveys with behavioral studies of a forest bird community in the biodiverse lowland Sumatra to test whether the functional traits of body size and foraging behavior—arguably 2 of the most important functional traits determining prey vulnerability to predation risk—predict birds' attraction to heterospecific mobbing calls. At 4 forest sites spanning a spectrum of forest intactness, we characterized the resident bird communities using point-count and mist-netting surveys. We further characterized the component of bird communities attracted to standardized playbacks of mobbing calls produced by 5 resident bird species of roughly similar body size and foraging behavior. We found that (1) a large, diverse sub-community of bird species was attracted to these mobbing calls, (2) responding species tended to be small-bodied foragers of the under- and mid-story forest strata, similar to the species producing these mobbing calls, and (3) smaller birds and those that forage closer to the mid-story were more strongly attracted to the mobbing calls. Our findings add to the growing evidence of the ubiquity of heterospecific information networks in animal communities, and provide indirect evidence that the reduction of predation risk is likely a major benefit and evolutionary driving force for the formation of risk-related information networks.

Sat-PM1-B-4

Has Logging Changed the Composition of Adirondack Forests?

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Abstract - Central Adirondack forests have 3 general histories: (1) those acquired before 1890 by New York State have had, for the most part, no logging; (2) those acquired in the next few decades were logged for mature softwoods but not for small softwoods or hardwoods; and (3) those on large private landholdings have been logged repeatedly for both softwoods and hardwoods. In 2009 and 2010, some colleagues and I sampled trees, understory plants and bryophytes on 47 transects in central Adirondack forests. We found significant structural differences between histories 1 and 2 and history 3 but few compositional ones. The unharvested forests had all the big trees, but no unique vascular plants. The harvested ones were smaller but had somewhat higher diversity. One or 2 common vascular plants were common in the harvested forests, and 1 in the unharvested ones. Three epiphytic bryophytes, all commonly regarded as old-growth indicators, were frequent in the old growth and almost absent from the harvested woods.

Sat-AM2-C-2

A Fungal Biodiversity Inventory of the Boston Harbor Islands

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Abstract - The Kingdom Fungi constitutes a major eukaryote clade. Currently, 100,000 species of fungi have been described of the 5.1 million estimated species. Collecting fungi is important for describing fungal diversity, revising taxonomy, and determining systematic relationships using morphological and molecular characters. All Taxa Biological Inventories (ATBIs) attempt to collect and describe all organisms within a particular geographical region. The Boston Harbor Islands National and State Park is comprised of 30 islands and 4 peninsulas encompassing a variety of ecosystems. Park habitats include palustrine and estuarine wetlands, coastal beaches, bluffs, and cliffs, and upland forests and shrublands. Beginning in 2005, The National Park Service began an ATBI for the Boston Harbor Islands. Thus far, the focus has laid on vertebrates, vascular plants, lichens and bryophytes, marine invertebrates, and terrestrial invertebrates. In partnership with Harvard University, and with undergraduate student interns from the University of Massachusetts-Boston, the inventory has expanded to include the fungal kingdom. Since December 2012, specimens of saprotrophic fungi on dead plant material (dead wood and leaf litter), fungi parasitic on animals, and mutualistic fungi (mycorrhizae-forming fungi) have been collected from Thompson Island, Peddocks Island, and Grape Island as well as from the World's End peninsula. Habitat information and substrate/host data are collected for each specimen. Collections are dried using a food dehydrator, and voucher specimens are deposited at the Farlow Herbarium. Rice grain-sized tissue samples of vouchers are separated from each collection and frozen for DNA extraction. PCR amplification of the internal transcribed spacer (ITS) ribosomal RNA gene region is performed, as this region usually varies between species within a genus but shows little to no intraspecific variation. Typically, 2 ITS sequences are considered conspecific if they differ by <3%. In this presentation, I discuss the initial results of our fungal inventory at the Boston Harbor Islands.

Sat-PM1-D-3

Managing for Ecological Flows at the Watershed Scale: The Connecticut River Watershed Study

Katie Kennedy (The Nature Conservancy, Connecticut River Program, Northampton, MA; kkennedy@tnc.org) and **Kim Lutz** (The Nature Conservancy, Connecticut River Program, Northampton, MA; klutz@tnc.org)

Abstract - The Connecticut River watershed is one of the most highly-dammed watersheds in the world. To complement efforts to restore river ecosystem function by dam removal, the Connecticut River Watershed Study was initiated with an aim to improve the flow management of those dams unlikely to be removed. The study sought to answer 3 primary questions: (1) what were river flows before the watershed was dammed? (2) how are flows in the watershed currently managed? and (3) how can flows be managed to improve ecosystem function while maintaining the intended uses of dams? We developed watershed models to simulate both the natural hydrograph and reservoir operations throughout the watershed. To develop alternative management strategies, we identified specific locations throughout the watershed for their critical ecological value, and elicited expert opinion to develop ecological flow requirements for target organisms of the instream, riparian, and floodplain communities. We then converted ecological flow requirements to penalty functions to evaluate trade-offs with other utility functions such as hydropower generation, flood risk management, and water supply reliability. We present the study results, including the primary forms of hydrological alteration impacting the Connecticut River ecosystem, a case study for developing management alternatives using the optimization model, and recommendations for application to river ecosystem management decisions in the Connecticut River watershed and beyond.

Sat-PM1-C-1

Characterizing Vernal Pool Biogeochemistry Across a Gradient of Human Disturbance

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Abstract- Vernal pools are small wetlands that are crucial for maintaining herptile biodiversity in northeastern forests. These seasonal wetlands are an excellent example of small natural features in a landscape that can have a broad impact on the much larger ecosystem around them. The pools' size makes them especially vulnerable to human disturbance, which can have detrimental ecological and water-quality effects. Understanding the dynamics between water, sediments, and biota is crucially important for the conservation and management of vernal pools and the ecosystems and animals that depend on them. We will explore pool water chemistry, carbon turnover, cycling of nutrients (i.e., phosphorous and nitrogen), and respiration rates close to the sediment water interface. We will examine if these seasonally inundated wetlands are closed systems with respect to nutrients, and investigate the drivers behind the chemical reactions in the pools. We will periodically monitor pH, dissolved oxygen, strong acid anions, strong base cations, gasses (CO₂, CH₄, and NO₂), P, N, Fe, Mn, Al, dissolved organic carbon, and chlorophyll at 4 Maine vernal pools between April and August 2016 in order to characterize their biogeochemical budgets. We hypothesize that (a) vernal pools release and potentially export phosphorous and iron to surrounding waters, but sequester and reduce nitrogen, and (b) pools vary in their biogeochemical activity, water chemistry, soil respiration rates, and nutrient cycling. This research will allow us to identify key changes in pool ecosystem functions in urbanizing landscapes and work to minimize these effects. We are also interested in the influence of biogeochemical processes on the health of organisms in the pools and how this influences public policy and land development with respect to vernal pool protection. The results of this study will be used to inform ecologists, developers such as civil engineers, and public agencies who work with vernal pools on the implications of biogeochemical processes with respect to nutrient cycling and transport.

Sun-AM2-C-3

The Role of Microbial Interactions in Coastal Sediments: An Overview

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Abstract - This paper will provide an overview of some of the complex dynamics within marine benthic microbial communities, focusing on changes in composition within those communities due to exposure to pollutants, and examining the diverse adaptive mechanisms demonstrated by pollutant-tolerant microbes. Examples will include a variety of ciliated protozoans and diatoms observed in the Microbial Ecology Laboratory, as well as studies on bacterial degradation and uptake of metals by algae in polluted harbors.

Sat-AM2-B-1

Disease in a Mesocarnivore: Modeling Disease in Vermont Fisher Populations using a Circuit-Based Model

Nathaniel S. Laymon (Green Mountain College, Poultney, VT; laymonn@greenmtn.edu) and **Carol Shaw** (Green Mountain College, Poultney, VT; shawc@greenmtn.edu)

Abstract - In Vermont, *Martes pennanti* (Fisher) play an extremely important role in the forest ecosystems and fill a niche that few if any other predators do. With the loss of most of the state's larger carnivores, mesocarnivores such as the Fisher and *Lynx rufus* (Bobcat) have filled the gaps and play a much larger role in maintaining the ecosystem as well as Vermont's forest based economy. With the loss of any of these now top predators, the system could collapse. A more complete understanding of the epidemiology of disease-based pandemics and potential for total loss of species is critical to the conservation and management of Vermont's top predators. In addition, such disease outbreaks may prevent recovery efforts for reintroduced species such as *Martes americana* (Marten) here in Vermont as well as other species already in significant risk and low numbers. Modeling is an important tool that will allow us to simulate and look at movement patterns of wild populations and also allow us to potentially identify the movement of disease outbreaks those populations. Modeling the potential wildlife corridors throughout the state could play a key factor when trying to manage for an outbreak of any disease. We will use trapper data collected from 2010 until 2014 by the Vermont Department of Fish and Wildlife, and conduct an analysis of movement barriers and suitable habitat with ArcGIS and Circuitscape, a circuit based modeling program, to calculate movement potential for Fishers. We will create maps to show these potential movements as well as high Fisher densities in the state. The final outcome will provide a model to predict disease transmission based on Fisher movement and dispersal in the state and will identify potential management implications if a pandemic of any disease were to affect the Vermont Fisher population.

Sun-AM1-B-2

Seasonal Variation of Metals in Seaweeds from a Contaminated Site on the Providence River

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Abstract - Sediments and groundwater along the shoreline of the Providence River are contaminated with high concentrations of toxic metals such as Cu, Ni, and Pb from the long history of industrial activities in the area, and serve as an ongoing source of contaminant discharge to the river. Seaweed species concentrate these metals in their acquisition of nutrients and minerals needed for growth. This study looks at the seasonal variation in metal uptake of *Fucus vesiculosus* (Rockweed) and two (unspecified) species of *Ulva* (sea lettuce) collected from India Point Park in Providence. Samples collected during the summer had metal concentrations (dry weight) up to 1000 times the concentration in river water. We are currently analyzing samples collected during the winter. We hypothesize that these may have lower concentrations, possibly due to the presence of higher nutrient concentrations in the water in the winter. Comparing winter and summer uptake will help us understand the mechanisms controlling metal uptake by seaweeds and the risks posed to organisms in the Providence River ecosystem that depend on seaweed as a food source.

Sat-AM2-B-4

Community Forestry in the Boston Suburbs: Forest Management, Ecological Research, and Community Engagement

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Abstract - To many suburbanites, forested conservation land is something that should be protected and preserved. Often, this mentality limits the use of town forests to low-impact recreation, while also limiting the connection that community members have with their local woodlands. Building on existing municipal, non-profit, and academic partnerships in the Greater Boston Area, the Sustainable Working Landscapes Program has developed methods to engage community members in active forest management and ecological research to promote better understanding and sustainable use of conservation land. Carrying out improvement cuts using low-impact methods has proven to be an effective way of educating community members about sustainable forestry. By inviting citizens into active worksites, talking with a logger, and seeing how forests can be managed, it is possible to change their perception about how forests should be used. SWLP has also created a “citizen science” research program whereby volunteers and school groups assist in basic ecological data collection in their town forests. Projects have included measuring DBH and assessing crown health of hemlocks affected by *Adelges tsugae* (Hemlock Woolly Adelgid), or counting endangered orchid species along trails. These data are part of larger studies and can supplement the data collected by trained field technicians. By permitting research on conservation land, towns may benefit from greater knowledge about their forests. Long-term impacts of revenue-generating timber harvests can be assessed, invasive species can be monitored, and future management decisions can be better informed. Together, these methods provide effective ways for municipalities and non-profits to build connections between people and the forested land around them.

Sun-AM2-A-2

Effects of Upstream Reservoirs, Nutrients, and Light on Stream Metabolism and Benthic Algal Biomass

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Abstract - Reservoirs modify the natural flow regime of rivers and streams and can alter fish and invertebrate assemblages, but less is known about the effects of flow regulation on stream ecosystem processes. This study examined the effects of nutrients, light, and flow regulation by upstream dams on periphyton chlorophyll-a, gross primary productivity (GPP), and respiration. At each site, we measured stream stage using a pressure transducer in order to predict discharge. We established open-channel metabolism by measuring dynamics of dissolved oxygen and light. We installed nutrient-diffusing substrates in 5 blocks within 3 streams with upstream reservoirs and 3 unregulated forested streams in central and western Massachusetts. Glass (inorganic substrate) or cellulose (organic substrate) disks were deployed in 4 nutrient treatments: nitrogen (as nitrate), phosphorus, nitrogen and phosphorus, and un-enriched controls. We calculated nutrient-response ratios for chlorophyll-a, GPP, and respiration on disks as the ratio of the mean nitrogen and phosphorus treatment divided by the mean control treatment for each stream. We predicted that stream metabolism and periphyton chlorophyll-a would be nutrient and light-limited, and that regulation by upstream dams would both alter stream metabolism and the effect of nutrient enrichment on stream metabolism. Respiration on cellulose disks was limited by nutrients; 2 streams were phosphorus limited and 1 was co-limited by nitrogen and phosphorus ($P < 0.05$). There was no evidence of nutrient limitation on respiration, GPP, or chlorophyll-a on glass disks. However, GPP and chlorophyll-a on un-enriched glass disks was positively related to light ($P_{GPP} = 0.01$, $P_{Chl} = 0.005$). Nutrient response ratios did not differ between regulated and unregulated streams for GPP, chlorophyll-a, or respiration on glass disks or respiration on cellulose disks (all $P > 0.05$). Nutrient enrichment increased respiration on cellulose disks to a similar extent in regulated (1.8x) and unregulated (1.7x) streams. Preliminary analysis of open-channel stream metabolism indicated respiration dominated overall stream metabolism in these shady forested streams. Overall, light and nutrients had stronger influences on stream ecosystem metabolism in this study than the presence of upstream dams.

Sat-PM1-C-2

Fitness of Wood Frog and Spring Peeper Tadpoles Affected by Temperature and Road Salt Interactions

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Abstract - Road salt deposition is a common practice in New England during the winter to de-ice roads. Consequently, spring snowmelt produces highly saline runoff that can infiltrate vernal pools near roads. Many studies have linked road salts to reduced amphibian densities, developmental deformities, disruption of osmoregulatory processes, and altered behavior. New England is also expected to experience a 3 °C mean increase in temperatures by 2050, which could lead to changes in life history, distribution, and behavior. Climate changes can also interact synergistically with other threats to amphibians such as disease and pollution. Our objective was to determine whether there is a synergistic relationship between salinity and temperature that is capable of affecting the performance of *Lithobates sylvaticus* (Wood Frog [LISY]) and *Pseudacris crucifer* (Spring Peeper [PSCR]) tadpoles. We performed a fully randomized and replicated mesocosm experiment in the summer of 2014 by randomly assigning 48 mesocosm tanks to one of 12 treatments, which included all possible combinations of species (LISY, PSCR, and both species), temperature (ambient or elevated 3 °C), and salt (none or elevated by 1600 mg/L). Contrary to our expectations, no synergistic effect was observed between temperature and salinity, but these factors individually had pronounced effects on tadpole performance. Increased temperature and salt significantly reduced survival to metamorphosis of LISY ($F_{1,22} = 28.48$, $P < 0.001$; $F_{1,22} = 6.68$, $P = 0.017$) and PSCR ($F_{1,21} = 36.04$, $P < 0.001$; $F_{1,21} = 4.64$, $P = 0.043$) tadpoles. Salt additions decreased LISY survival from 90.4% to 62.3% and PSCR survival from 56% to 14%. Increased temperature and salt also affected development time of LISY ($F_{1,21} = 513.15$, $P < 0.001$; $F_{1,21} = 62.76$, $P < 0.001$) and PSCR ($F_{1,15} = 57.99$, $P < 0.001$; $F_{1,15} = 9.93$, $P = 0.007$), with earlier emergence under elevated temperature treatments and later emergence under increased salt treatments. Overall, species responses to salinity, temperature, and competition followed similar patterns. However, we note that PSCR seem particularly sensitive to salinity, thus salt application to roads may explain why PSCR presence is often low in urban landscapes. A reduction in or more strategic deposition of road salts could minimize impacts to wetlands and wetland fauna.

Sun-PM2-B-2

Mycelial Growth, but not Conidiation, of *Pseudogymnoascus destructans* Depends on Relative Humidity Levels

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Abstract - *Pseudogymnoascus destructans* is the causal agent of bat white-nose syndrome (WNS), an emerging infectious disease that has decimated bat populations in the Northeastern US. The fungal pathogen is psychrophilic and well adapted to temperature conditions encountered in bat hibernacula, but it has not been established how relative humidity (RH) impacts the development of the fungus. Humidity is known to fluctuate widely within and across bat hibernacula and may be as low as 60% and as high as 100%. The objective of this study was to determine optimum humidity levels for *P. destructans* mycelial growth and conidiation, utilizing RH levels ranging from 70 to 96.5%. Humidity chambers of varying humidity levels (70, 81.5, 89.5, 96.5%) were set up using supersaturated salt solutions and deionized water, and Sabouraud dextrose agar plates inoculated with *P. destructans* MYA-4855 were kept in chambers. Once weekly for 3 weeks, mycelial growth diameter and conidia amounts were recorded on destructively harvested plates. By 2 and 3 weeks post inoculation, mycelial growth increased significantly as RH increased ($R^2 = 0.24; 0.37, P < 0.001$) with 70% RH showing significantly less vegetative growth than 81.5% RH and above. The optimum RH for vegetative development was 96.5%, followed by 81.5 and 89.5%. Conidia formation was not significantly impacted by RH levels by weeks 1 and 2 ($R^2 = 0.02; 0.00, P > 0.05$), but by week 3 increasing RH yielded increased conidia numbers ($R^2 = 0.11, P < 0.05$) albeit with a weak linear relationship between RH and conidia produced per colony. The humidity range permissive for significant mycelial development is fairly wide (i.e., >81.5%) but results do indicate that microclimates within a bat hibernaculum where RH is on the lower end of recorded hibernacula RH regimes should impede mycelial growth, which could restrict infection severity and/or colonization of organic matter. Surprisingly, based on these results, lower RH does not restrict *P. destructans* production of conidia, which serve as important transmission propagules. Therefore, lowering RH as a means to mitigate on-going outbreaks in afflicted hibernacula may be of limited value in stemming pathogen dispersal from infected to healthy bats.

Sat-PM2-B-2

Gradients in an Adirondack Peatland

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Abstract - *Larix laricina* (Eastern Larch) and *Picea mariana* (Black Spruce) are dominant conspecific tree species in open boreal wetlands in the northeastern United States. Little is known about the relationship between fine-scale hydrologic and abiotic factors and the relative abundances of these co-occurring species. We hypothesized that these species would correlate with different abiotic conditions due to both their silvics and coexistence in habitats where resources and conditions are challenging to plant growth. In order to describe abiotic gradients that correlate with Black Spruce and Eastern Larch abundances at local spatial scales, we collected data on stem abundances, pH, conductivity, depth to water table, water temperature, dissolved oxygen, and inorganic and dissolved organic nitrogen concentration and canopy closure data, from forty-two 5-m-radius plots along 6 transects in an Adirondack wetland. We regressed stem abundances with univariate and multivariate habitat axes (developed using PCA). Stem abundances in both species were more strongly correlated with single variables than they were with the habitat variables developed using PCA. Larch stem abundance was strongly, negatively correlated with canopy closure. Also significant was a positive correlation with depth to groundwater. Black Spruce stems were significantly negatively correlated with water temperature. Nitrogen concentrations in the groundwater were collected in 21 plots in 2014 and were not useful predictors of stem abundance in either species. These outcomes are consistent with the idea that Eastern Larch and Black Spruce establish along different abiotic gradients at the scale of tens of meters within this study wetland. The strong negative relationship between spruce stem abundance and water temperatures has not been previously reported. Sampling more wetlands will allow us to determine the universality of these patterns and climate-change implications for these 2 species in northeastern wetlands.

Sun-AM1-A-2

Centuries of Damming: Consequences for Alewives (*Alosa pseudoharengus*) and Two Species of Perch in Coastal Ponds

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Abstract - Anadromous *Alosa pseudoharengus* (Alewife) and *A. aestivalis* (Blueback Herring), collectively River Herring, populations have declined in New England beginning in the 1600s, largely from aquatic habitat fragmentation from dams. As a result, seasonal influxes of juvenile River Herring into freshwater ecosystems have been severely reduced. Juvenile River Herring supplement freshwater food webs by providing nutrient- and lipid-rich forage items to resident predator fish. A paucity of forage fish may influence trophic dynamics and directly impact River Herring predators. Seasonal influxes of forage fish may increase predator fish condition during summer months and contribute to overwinter survival. To test the effects of juvenile River Herring density on predator condition, we collected *Morone americana* (White Perch) and *Perca flavescens* (Yellow Perch) from 3 herring and three non-herring ponds in eastern Massachusetts. We used linear mixed-effects models to compare morphometric and physiological indices of predator-fish condition among ponds. We used other ecosystem-specific data to inform models such as perch abundance, temperature, zooplankton density, month, and habitat. Our results indicate the importance of juvenile River Herring density and other environmental variables to perch condition during summer months. We further explore the effect of River Herring on freshwater ecosystems by describing the diets of perch in the presence and absence of Alewives. The results of this study highlight the long-term indirect ecosystem effects of dams, and demonstrate the importance of native forage fish to native freshwater predators.

Sat-PM1-C-5

Territoriality of the Robber Fly *Lasiopogon slossonae* (Diptera: Asilidae) in a riparian zone near Lake Placid New York

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Abstract - Robber flies are an abundant and diverse family of voracious predatory flies. The more than 7000 known species of robber flies (Diptera:Asilidae) play an important ecological role in suppressing lower trophic-level insect populations, and as a result, are integral to insect community structure and dynamics, with consequent impact on many other organisms in almost any terrestrial community. Over the last century, there has been extensive research on robber fly systematics; however, there has been little research conducted on robber fly population ecology and ethology, resulting in a sometimes confusing literature pertaining to abundance, longevity, predation, mating, and territoriality. We believe that *Lasiopogon slossonae*, a smaller-sized species of robber fly found throughout northeastern North America, may be important in controlling black flies (Simuliidae). Results of our mark-recapture studies and day-long observations suggest a limited territoriality of this species even as it lives in the vicinity of larger dragonfly (Anisoptera) and damselfly (Zygoptera) predators.

Sat-AM1-D-2

Discovering the Diversity of Anhydrobiotic Tardigrades in Onondaga County, NY

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Abstract - Tardigrades, also known as water bears, are invertebrates belonging to the phylum Tardigrada that have been found all over the world. They are known as water bears because of their appearance that resembles a tiny bear. These organisms can be found in terrestrial, limnic, and marine substrates. In the presence of unfavorable conditions such as desiccation, freezing, and low oxygen, they are able to enter a latent state of cryptobiosis. Since 1778, over 1150 tardigrade species have been identified and are published in continuously updated checklists. Only one publication by Strayer et al. (1994) covers tardigrades in New York State and describes specimens found in southeastern New York State. Little information exists on the presence and distribution of these organisms throughout the rest of New York. The objective of this research is to complete a survey of tardigrades in Onondaga County, NY, with the intention of identifying which species are present as well as the distribution of those species across the county. We collected a total of 64 substrate samples from bodies of water around Onondaga County. Tardigrades and eggs were washed from substrate samples and isolated for DNA extraction. We amplified and sequenced the internal transcribed spacer (ITS) rDNA region for species determination and phylogenetic analysis in order to assess diversity. Initial sequence data indicate that 2 genera, *Ramazzottius* spp. and *Milnesium* spp., are present.

Sat-AM2-D-2

Serpentinite Outcrops in Massachusetts: A Botanical and Ecological Overview

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Abstract - During the summer of 2015, we surveyed outcrops of serpentinite bedrock ("serpentine"), along with outcrops of neighboring schist and amphibolite, in western Massachusetts (Hampden and Berkshire counties). We identified vascular plants, bryophytes, and lichens occurring on the 3 lithologies (either directly on the rock or on associated soils) to species. We collected soil samples from across serpentine-schist and serpentine-amphibolite lithological contacts, data on canopy cover and understory composition along the soil transects, and vascular plant tissue from species common to multiple lithologies for foliar chemistry analysis. Here, we outline the preliminary analyses of these data, with final results to be published in the coming year. We present the following new results: (1) revised bedrock geologic maps of the areas studied based on GPS-located outcrops, (2) diversity comparisons of vascular plants, bryophytes, and lichens between distant serpentine outcrops and between serpentine outcrops and neighboring lithologies, (3) analyses of overstory and understory composition with respect to soil chemistry, and (4) comparison of foliar chemistry of common vascular plant species occurring on and off serpentine. Serpentine outcrops in western Massachusetts tend to support closed-canopy forests dominated by *Tsuga canadensis* (Northern Hemlock) and *Fagus grandifolia* (American Beech), with an understory of herbaceous perennials and bryophytes. In this respect, they are quite similar to neighboring lithologies. Cliff faces of serpentine bedrock are more floristically distinct from other nearby rock types, with *Asplenium* spp. ferns (e.g., *A. trichomanes* [Maidenhair Spleenwort Fern] and *A. rhizophyllum* [Walking Fern]) and the calcicolous moss *Anomodon attenuatus*. Serpentine outcrops are also distinctive in what species they lack; for example, lichens in the family Umbilicariaceae (rock tripes) are wholly absent from serpentine cliffs but common on vertical faces of amphibolite and schist. With these observations in mind, we suggest changes to the treatment of serpentine outcrops in the Massachusetts classification of natural communities and highlight the most significant threats facing this habitat in the state.

Sun-AM2-D-2

Bat Species Distribution Across Habitat Gradients Throughout Massachusetts' State Properties

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Abstract - In 2015, the Massachusetts Department of Conservation and Recreation (DCR), in collaboration with the Massachusetts Division of Fisheries and Wildlife and the US Fish and Wildlife Service, continued a bat-monitoring program to evaluate presence, distribution, and activity level of bat species on DCR properties across the Commonwealth. I conducted passive acoustic surveys in various habitats at 46 sites on 8 DCR properties to evaluate bat species presence and activity levels across ecological and habitat gradients. Surveys were conducted during 2 sessions, 01 July to 15 August 2015 and 16 August to 27 September 2015, on state properties across 6 ecoregions. I visited each twice and left detectors in the field for at least 4 nights in order to assess the variability in detection across evenings, weather conditions, and season. I conducted habitat assessments at each detector location in order to characterize each site. All 9 bat species native to Massachusetts were detected between June and September. I am in the process of manually vetting the data to confirm auto identification. Bat activity was highest between 01 July and 15 August 2015. Bat activity levels differed across properties and between sampling sessions. Results from this research will assist the planning of future bat survey work throughout the state.

Sat-PM2-B-3

Use of Track Count Data to Influence Successful Placement of Remote Cameras to Monitor Wildlife

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Abstract - Starting in 1976, the author established The Wolfrun Track Count, a 4-season field study monitoring *Lynx rufus* (Bobcat), *Ursus americanus* (Black Bear), *Martes pennati* (Fisher), and other wide-ranging mammal species within a 6-mi² study area on the northwestern flank of the Green Mountains in Vermont. Now the longest-running survey of its kind, we have discovered and monitored repeated visitations to a variety of scent-marking stations by each of the above species. We believe this information can powerfully guide wildlife researchers as we seek to effectively deploy remote cameras. Our successful detection and photo-capture of cryptic focal species has increased exponentially since we have abandoned random placement of cameras along wildlife travel routes. Targeting known scent-marking stations instead enables us to capture focal species much more reliably, as well as confirm their continuing occupation of a given habitat over time. Of further significance, our non-invasive approach does not rely upon using artificial baits to attract animals. Instead, the animals we are studying are naturally attracted to visit and investigate their own olfactory communication stations.

Sun-AM1-B-3

Using Boulders to Evaluate the Effects of Overbrowsing in Eastern Deciduous Forests

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Abstract - Browsing by overabundant *Odocoileus virginianus* (White-Tailed Deer) has been shown to reduce plant diversity, shift composition towards browse-tolerant and unpalatable species, and simplify vegetation structure. An accurate appraisal of such impacts is necessary for assessing the need for conservation management as well as the efficacy of mitigation efforts. Tall boulders that restrict deer access can function as refugia for plant species and therefore provide somewhat of a reference against which to compare extant vegetation communities. We sampled plant communities on tall boulders, low boulders, and nearby forest floor to test the degree to which deer have affected the understory of one of the largest remaining old-growth forests in the eastern United States. These tall boulders are inaccessible to deer, whereas deer can easily browse both the low boulders and forest floor. Plant communities growing on low boulders and the forest floor were nearly indistinguishable, with no significant differences in vegetation cover, richness, diversity, or composition. However, vegetation cover, richness, and diversity were all significantly greater on tall boulders than forest floor plots and low boulders, and there was minimal overlap in composition. Tall boulders were characterized by a diverse mix of forbs, shrubs, and understory trees that sharply contrasted with the sparse understory of the forest floor, dominated by *Acer saccharum* (Sugar Maple) saplings. These results demonstrate that overbrowsing by deer has caused a biodiversity collapse in what has been considered a pristine old growth forest. Since vegetation surveys and exclosures that predate overbrowsing are rare, these boulder refugia now represent the only means by which to assess deer impact on forest diversity and composition across much of the eastern deciduous forest.

Sat-PM2-D-2

Mammal use of the Boston Harbor Islands: Seasonal versus Permanent Residents

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Abstract - We have been conducting small-mammal trapping on the Harbor Islands since 2008 and documenting the presence of large mammals through visitor sightings and remote sensing since 2011. *Peromyscus leucopus* (White-Footed Mouse) and *Microtus pennsylvanicus* (Meadow Vole) are permanent residents on the islands and exhibit annual population fluctuations. In addition, White-Footed Mouse populations experience significant annual variations in body mass. Larger species such as *Odocoileus virginianus* (White-tailed Deer), *Canis latrans* (Coyote), and perhaps *Procyon lotor* (Raccoon) appear to move between the islands and mainland. These larger mammals are potential predators and/or resource competitors of small mammals; however, their ephemeral presence makes it difficult to assess their impacts. I will discuss the unique dynamics of the mammals on the islands and how we plan to assess their interactions.

Sat-PM1-D-5

Acoustic Surveys for Bats are Informative but Complicated: Thoughts on a Multifaceted Survey Tool

Kathleen O'Connor (Environmental Resource Management, Syracuse, NY; kathleen.oconnor@erm.com)

Abstract - A systematic study of bats can be a challenge to researchers, due to the unique biology and behavior of this taxa. Bats are small, secretive, nocturnal, and highly mobile—each of these aspects makes them difficult to monitor effectively. Many bat survey methods require highly trained biologists and are often both time-consuming and spatially limited. While acoustic surveys have long been used as a monitoring tool for bats, a number of recent developments has resulted in an overall increase of this survey technique in recent years. The use of acoustics as a survey technique has many benefits. An acoustic detector can sample bats without disturbance or stress to individuals; detectors can be deployed over long periods of time and across greater distances than can be monitored through other survey methods; and detectors can be placed in areas where nets or traps cannot sample. Additionally, acoustic sampling offers a way for citizen scientists to observe and learn about bats; programs now exist in many sites where volunteers are trained to collect acoustic recordings, with minimal supervision by bat biologists. Nevertheless, sampling bats through acoustic surveys does have several drawbacks. Although a few software programs exist to identify bat calls to species, all programs work in different ways and are inconsistent with each other. Known reference-call libraries are still limited, and the bats themselves have plasticity in their calls which can result in false positives. Reliable identification of calls still requires an experienced person, and data management can be cumbersome. This presentation will provide an introduction to the general benefits and drawbacks of acoustics surveys, including descriptions of cases where acoustic monitoring succeeds as a survey tool, and where it falls short. While acoustic surveys do have their limitations, they remain a powerful technique to evaluate and monitor bat populations, and the method is likely to remain a crucial tool to bat biologists for many years to come.

Sat-PM2-B-4

Prevalence and Co-infection Dynamics of Ranavirus and Chytrid Fungus in Central New York

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Abstract - Despite the large role played by the chytrid fungus *Batrachochytrium dendrobatidis* (Bd) and ranavirus in amphibian declines around the world, few studies have tracked the local dynamics of these pathogens across multiple years, and almost none have investigated co-infection rates. To address long-term patterns of prevalence and evaluate associated abiotic and biotic infection factors, we began a survey of local amphibians in Oswego County, NY, in 2012. Over the first 4 years of the study, a total of 564 identifiable individuals were tested for both pathogens. Prevalence of ranavirus across all study years was relatively stable, ranging from 23 to 38%. Bd prevalence, however, fluctuated widely from a high of 26% in 2012 to lows in 2013 (2%) and 2014 (6%), and another peak in 2015 (25%). Co-infection rates also varied annually (7% in 2012, 1% in 2013, 0.6% in 2014, 10% in 2015). Out of 14 species sampled, all co-infections were confined to *Lithobates clamitans* (Green Frog), *L. catesbeianus* (Bull Frog), and *Eurycea bislineata* (Two-lined Salamander). Ranavirus exhibits prevalence patterns associated with sex that are similar to those of sexually transmitted infections in humans, but the large annual fluctuations in Bd prevalence suggest that pathogen is more sensitive to seasonal environmental factors. Co-infection rates are generally low, which does not support synergism between ranavirus and Bd in most species local to central New York. However, co-infections do track the overall prevalence of Bd, suggesting that future changes in Bd virulence or geographic range could increase the susceptibility of amphibians to additional emergent diseases.

Sun-PM2-B-1

Growing Sweetflag, an Iroquois Medicinal Plant

Aswini Pai (St. Lawrence University, Canton, NY; apai@stlawu.edu)

Abstract - *Acorus calamus* L. (Sweetflag, family Acoraceae) is a wetland species important to many Native American cultures, including the Iroquois. Though fertile diploid varieties of the species are found in northeast America, seedlings are absent, and populations seem to be established by rhizomes. I compared rhizome growth to seed germination by growing rhizomes under low, medium, and high nutrient, moisture and light regimes and, germinating seeds under spring, summer, and fall temperatures in different light regimes. Both seeds and rhizomes of *A. calamus* grow significantly ($P < 0.05$) better in open-light, waterlogged conditions. Also, seeds germinate most rapidly under summer conditions. Results indicated that *A. calamus* seed stock as well as bareroot are adapted to grow in a wide variety of wetlands in summer and spring but are limited by light availability. The absence of seedlings might be explained by severe flooding in wetland areas that proves anoxic for the seedling but can be tolerated by the rhizome, which has a reservoir of stored carbohydrates that enable anaerobic respiration.

Sat-AM1-C-3

Thirty Years of Hawk Watching in the New York Metropolitan Area

Trudy Battaly (North East Hawk Watch, MA; merlin@pipeline.com) and **Drew Panko** (North East Hawk Watch, MA; dpanko@pipeline.com)

Abstract - Hawk watches collect migration data for numerous species of hawks. This data is influenced by factors such as weather, coverage, and shifting source regions, as well as raptor population levels. This presentation reviews the migration trends at watch sites in the NYC metropolitan area, with an emphasis on estimating falcon population changes, and the wind and weather factors influencing the yearly counts.

Sun-AM1-C-3

The Use of Multiple Signaling Channels to Overcome Noisy Environments

Sarah Partan (Hampshire College, Amherst MA; partan@hampshire.edu)

Abstract - Urbanization and climate change are rapidly affecting many aspects of animal habitats, including the air and water through which animal communication signals are transmitted. As noise permeates the environment, animals must either relocate or adjust their signaling strategies to be heard. One way to overcome acoustic noise is to switch emphasis from the auditory channel to another sensory channel such as visual or chemical. In this talk, I will show some examples of animals that are taking this approach of switching channels, and will describe my work on alarm-calling behavior in urban and rural populations of *Sciurus carolinensis* (Eastern Gray Squirrel).

Sat-PM1-B-5

Life On The Edge: Microbial Communities In An Urban- Industrial Estuary

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Abstract - The Providence River has been subjected to centuries of industrialization that has exposed the river to high levels of heavy metal and organic contamination and impacted the ecosystem immensely. Bold Point Park (BPP) began as a shipyard from the 1780s to the 1840s when it served as both a terminal for the Providence and Boston Railroad, which further increased industrial pollution. Now, increased use of the site by the public has added to the estimated 27,000 cubic yards of shoreline debris accumulated along the river by 1980. This legacy pollution has had a significant impact on the estuarine microbial ecosystem. High levels of Arsenic (14.5 mg/kg), Copper (90.8 mg/kg), Lead (52.5 mg/kg), and Zinc (163.4 mg/kg) were present in clams found at BPP. We analyzed sediment samples for total organic/ inorganic carbon (TOC/TIC) by FT-IR analysis and found concentrations of $1.67\% \pm 0.68\%$ and $9.06\% \pm 5.50\%$, respectively. We carried out identification of the microbial community using 16SrDNA sequencing, which revealed a large presence of sulfate-reducing and halophilic microorganisms. Despite decades of urban redevelopment, BPP remains a significantly polluted estuary that has an increasingly higher impact on the public as the heavy metal and organic pollutants travel up to high orders of life.

Sat-AM2-B-3

Dams and the Aquatic Angiosperm *Podostemum ceratophyllum*: What Story is this Species Telling?

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Abstract - *Podostemum ceratophyllum* (Riverweed) is often a focus of conservation concern and reported to be sensitive to environmental impacts on rivers. Yet its present distribution in the northeast seems to indicate that species is quite resilient. Riverweed is native to eastern North America (Arkansas and Mississippi in the southeastern US north to New Brunswick, Canada). It is common in many rivers, where the plants grow attached to rocks in swift currents. Dense beds sustain communities of invertebrates and fish; in fact, secondary production by filter feeders in Riverweed beds is among the highest ever recorded for rivers. Riverweed is a species of special concern in some states (e.g., RI, NY, CT, VT) as populations are few or in decline, generally attributed to human disturbance. The occurrence of these plants is considered indicative of clean water and low sediment load. The latter reflects its reported sensitivity to sedimentation. The life cycle of Riverweed is closely linked to seasonal water-level change. Flowering occurs during the low-water period when plants are exposed. Therefore, water-level manipulation that changes the natural seasonal pattern would be expected to have negative impacts. Certainly, the construction of a dam and the concomitant flooding of river-rapid habitat upstream results in loss of the plants. However, impacts from water-level manipulation downstream of dams are poorly understood. Conservation concerns seem to be at odds with patterns of current distribution and abundance. Our field surveys of heavily manipulated rivers in New England provide circumstantial but convincing evidence that *P. ceratophyllum* is resilient to water-level manipulation and other perturbations associated with dams. Extensive populations occur in rivers that have experienced decades-long impacts from dams (often multiple), e.g., Lamprey River, NH; Connecticut River, MA; Charles River, MA; and Shetucket River, CT.

Sat-PM1-C-4

Landscape-Level Analysis of Drivers of Aquatic Macrophyte Species Richness in the Adirondack Park of New York State

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Abstract - Identifying the relative fit of drivers of aquatic macrophyte species richness is necessary for the effective conservation of biodiversity in lakes and provides fundamental understanding of aquatic macrophyte communities. Using multiple regression, we investigate the relative influence of water quality, lake morphology, geographic and landscape drivers, and humans on the richness of macrophytes in lakes in the Adirondack Park of New York State. To further investigate species-area relationships in the dataset, we used null model analysis to test for the passive-sampling hypothesis which is a non-biological explanation for the phenomenon. We found, ordered by slope coefficient, bed area (0.45), UTM X (0.30), road density within 100m of a lake (0.24), surface water area upslope (.18), elevation (-0.17), and lake isolation (0.14, larger values of represent less isolation) to explain 64% of the variation in species richness. We reject the passive-sampling hypothesis for the species-area relationship regarding bed area, revealing a biologically relevant species-area relationship. We found no significant influence of lake area, watershed road densities, urban isolation, Y, lake and bed effective fetch, bed isolation, and water quality on richness. If the goal of conservation is promoting biodiversity, lake area, the categorization of "pristine waters", and climate refugia should not be used as parameters in the conservation process. Our results also reveal insight into meta-community dynamics in aquatic macrophyte communities. At the regional scale, isolation is a significant driver of richness, giving evidence to the relative importance of patch dynamics; while at the bed scale, isolation is insignificant, giving evidence to the importance of mass effects at the lake scale.

Sun-AM1-A-1

Live Longer by Living Alone and Staying Active: Why Eastern Small-footed Myotis Appear to Have a Lower Mortality from White-Nose Syndrome

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Abstract - White-Nose Syndrome (WNS) is having a devastating impact on bat populations throughout the eastern United States. Although some species of hibernating bats have experienced declines of over 90% of their population, *Myotis leibii* (Eastern Small-Footed Myotis) and *Eptesicus fuscus* (Big Brown Bat) have seen lower levels of decline than other hibernating bat species. Their persistence is likely due to behavioral strategies that reduce their risk of exposure to the disease, such as hibernating in cold, isolated hibernacula where risk of contamination and propagation of the fungal agent is reduced. We studied the winter activity of *M. leibii* and *E. fuscus* at a site where both species have been documented roosting and foraging throughout the summer. Acoustic monitoring data suggests that *M. leibii* and *E. fuscus* are hibernating in close proximity to their summer range and active throughout the winter. We modeled winter activity as a function of meteorological variables, distance to a presumed local hibernaculum (Joe English Hill), and distance to an important local foraging site (Joe English Pond). Based on our random forest model, ambient temperature was the strongest predictor of winter activity for both species, with the highest rate of activity occurring when temperatures were above 12 ° C. Although most of the activity occurred during the evening, diurnal activity was detected for both species throughout the winter. The use of small isolated hibernacula near their summer range likely reduces the risk of exposure to the fungal pathogen that causes WNS. It is also possible that the high level of winter activity during periods of warm weather may allow bats to rehydrate and replenish depleted fat reserves enough to survive the effects of WNS.

Sat-AM1-B-2

Bryophytes of the Adirondack Alpine: A Work in Progress

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Abstract - Accurate species distributions are critical for addressing a wide range of questions regarding population dynamics and biological dispersal. Given current concerns regarding climate change and predicted shifts in the distribution of species, it is imperative that we have accurate historical as well as current presence/absence data in order to document future distribution shifts. Consequently, the primary objective of this project is to produce a comprehensive bryophyte species list for each of the Adirondack alpine summits. On the basis of over 700 herbarium records, 173 species of bryophytes have been recorded as occurring in the Adirondack alpine. Future work will include surveys of each of the Adirondack alpine summits in order to develop a comprehensive species list for each summit by first establishing if species recorded in the past are still present and to document new occurrences.

Sun-PM2-D-1

Are Kitchen Gardens Resources for Syrphid Pollinators?

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Abstract - Kitchen gardens are small-scale polycultures that usually contain diverse flowering species which can sustain pollinating fly species (*Syrphidae*). Syrphids occupy a niche similar to bees and can promote vegetable and fruit production in kitchen gardens. We examined the effect of vegetable patches and neighboring wild flowers on attracting *Syrphidae* species in St. Lawrence County, NY. We surveyed 12 kitchen gardens using Malaise traps. Traps were placed in the center and the edge of the kitchen gardens for 4 hours midday on clear sunny days during the summer. Syrphid species were identified using a dichotomous key. We also recorded floral diversity both within and outside each kitchen garden. We trapped about 250 specimens, with 75% being *Toxomerus* species. Syrphid diversity was significantly greater ($P > 0.05$) in kitchen gardens with greater quantity and diversity of floral resources.

Sat-AM1-C-2

Distribution and Range Expansion of Blue Crabs and their Interactions with Invasive Green Crabs

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Abstract - *Callinectes sapidus* (Blue Crab) is an important predator in Atlantic estuarine systems. During recent warm years, Blue Crabs have been sighted north of Cape Cod, which had been their historical northern range limit. Given that the Gulf of Maine is one of the most rapidly warming regions of the ocean, we are interested in the potential for Blue Crabs to expand their range north of Cape Cod, and what this will mean for estuarine communities, particularly populations of the invasive *Carcinus maenas* (Green Crab). During the summer of 2015, we surveyed Blue Crabs, Green Crabs, and other invertebrates in 17 estuaries ranging from CT to southern ME (focused mainly on Cape Cod) to understand how the crabs are currently distributed in New England, both within and among estuaries. We also evaluated different factors that may be controlling the distribution of Blue Crabs and Green Crabs, including temperature and species interactions. Large Blue Crabs can consume Green Crabs, but the 2 species also compete for shared prey, so as part of this research, we are testing the relative competitive and predatory abilities of the crabs under different temperature conditions in the lab. We are planning additional laboratory and modelling studies that will tease apart the effect of environmental conditions vs. species interactions on crab distributions, and examine how water temperature increase and Blue Crab introduction will affect estuarine communities north of Cape Cod.

Sat-AM2-C-3

Introduced Species have Different Traits than Natives in Riparian Plant Communities

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Abstract - Plant traits are a useful tool in describing the composition of plant communities. More particularly, they can be used to address the question of what determines the success of introduced species in a novel habitat. It has been hypothesized both that plants with traits similar to the native community might be more successful (due to a shared ability to tolerate or thrive in a given environment), or conversely, that plants more dissimilar in traits from the native community might be more successful due to exploiting an empty niche. I surveyed plant community composition in riparian zones of 53 small streams in the Upper Hudson Watershed (NY). Using information on 21 quantitative plant traits obtained from the TRY-DB plant traits database, I determined that the introduced species in these communities differ significantly in their trait composition from the native subset of these communities. This difference holds within particular growth forms and lifespans, so does not appear to be driven by differences in the proportion of species from different broad plant functional groups within the native and introduced portions of the community. This finding suggests that a primary mechanism of success of introduced species may be their ability to exploit unused niches in the novel environment.

Sun-AM2-D-1

Earthworm and Land-Use Legacy Effects on Carbon in the Forest Soils of Vermont

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Abstract - All earthworm species common to New England were introduced from either Europe or, more recently, Asia. Invasion of forests by exotic earthworms can cause considerable change to both soils and vegetation structure. However, many northeastern forests were cleared for agriculture well before the 20th century and may have a long legacy of earthworm population. The conversion from forest to farm also caused long-term loss of soil carbon. After reforestation, many of the soils in this region are experiencing a net gain in carbon. The impact of recent, “second-wave” invasions by Asian earthworms is not yet clear. Most studies have found short-term carbon losses after an earthworm invasion event. Other research suggests that earthworm-created stable soil aggregates may mitigate these losses through the long-term physical protection of carbon. The objectives of this study were to (1) survey a variety of forested regions in Vermont to determine the extent of current earthworm invasion, (2) quantify the amount of physically protected soil aggregates within a subset of forest stands with known earthworm populations, (3) determine the detailed land-use history of 18 monitored forest stands, and (4) conduct a controlled investigation on the effect of one of the most common earthworm species, *Aporrectodea tuberculatum*, on an earthworm-free undisturbed forest soil. The survey showed that earthworm presence is expansive across Vermont forests and that higher species diversity correlated with reduced forest floor depth, higher mineral soil carbon, and greater stability of that carbon. Prior land use in the 18 monitored plots included cultivation, pasture, and farm woodlot. Sites with the highest worm density and species richness had a history of agricultural land use (although not all former agricultural sites had earthworms). The controlled study confirmed prior research showing that earthworms can increase soil carbon stability. The future effect of earthworms on a particular forest stand will depend on a number of interrelated factors, including earthworm species (some are more aggressive), land-use history, invasion history, and likely soil chemistry (determining suitability). More work is clearly needed to understand the earthworm invasion patterns and the means of better controlling populations of the most aggressive species.

Sat-PM2-A-2

Ecosystem Services and Preserve Management: The Human Dimensions

Michael Rubbo (Teatown Lake Reservation, Ossining, NY; mrubbo@teatown.org)

Abstract - The management of ecosystems typically focuses on the outputs (i.e., goods and services) that ecosystems provide. While there are a variety of goals to management, most land managers focus on services that sustain or enhance the natural structure and functioning of ecosystems. This model of management has been extremely successful in conservation. However, this approach does have its limitations. Specifically, human interests can conflict with land management making progress difficult. While this is inherent in management in any locale, it is especially problematic in areas with high human population densities. The land conservation movement of the 1990s and early 2000s has created many smaller parks and preserves scattered throughout suburban landscapes. Managers of these areas have begun to focus on the active stewardship of the land. As many of these preserves are open to the public, conflicts have developed undermining management efforts. The majority of these conflicts can be traced to a basic lack of understanding of ecosystem functioning by the general public. I will highlight a few examples of specific management initiatives where user conflicts have developed and the strategies employed to balance management goals with human interests.

Sat-AM2-A-2

Patterns of Arthropod Diversity and Distribution in Boston Harbor Islands NRA

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Abstract - MacArthur and Wilson's theory of island biogeography predicts that island size and isolation are important predictors of species richness. We used this model to investigate patterns of diversity and distribution of 6 focal arthropod taxa across 9 islands in Boston Harbor Islands National Recreation Area between 2005 and 2010. Arthropod taxa were selected to cover a range of species richness, mobility, and functional roles, and included: Anthophila (bees), Mycetophilidae (fungus gnats), Carabidae (ground beetles), Curculionidae (weevils), Formicidae (ants), and Diplopoda (millipedes). Total species richness among taxa ranged from 16 species of millipedes to 152 species of bees. Island size was a reasonable predictor of species richness for 4 taxa: bees, ground beetles, ants, and weevils. However, an island's distance from the mainland was correlated with species richness for only 2 taxa: ants and fungus gnats. Community similarity (i.e., shared species composition) between pairs of islands was negatively correlated with distance between islands for 3 taxa: millipedes, ground beetles, and ants. We suggest that additional factors such as habitat diversity and habitat type (i.e., the presence of fresh water or mature forests), as well as human-aided transport of species, are likely significant drivers of invertebrate distributions across islands in Boston Harbor, affecting both species richness and community similarity.

Sat-PM1-D-2

Can We Feed Ourselves? Land-Cover Classification Analysis to Determine the Potential for Pasture-Raised Meat Production in the New York State Capital Region

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Abstract - Given the exponential growth rate of the human population, food systems must become more efficient and productive. The Food and Agriculture Organization of the United Nations (FAO) found that food production will have to increase by 70% globally by the year 2050 in order to feed the rapidly growing human population. Using remotely sensed data, a land-cover classification of New York State's capital region was completed to estimate the amount of land available for use as pasture for both conventional livestock management as well as Intensive Rotational Grazing (IRG) livestock management. The available acreage estimate was then used to calculate the amount of meat that could be produced for local consumption. Resulting estimates suggest that meat production from cows and sheep in the New York State capital region can be increased from 32 to 297 times above the current level of production. Despite the large production potential, actualization of that potential will still not meet local demand. Further research is being conducted at the state level to ascertain if meat production within New York State can satisfy demand.

Sat-AM1-A-2

Invasive Black Locust's Legacy Effects on Nitrogen Cycling in the Albany Pine Bush

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Abstract - Invasive species cause persistent financial and ecological damage, often despite management efforts. This "legacy effect" is observed in the invasion of *Robinia pseudoacacia* (Black Locust), a nitrogen fixing species at the Albany Pine Bush. This globally rare ecosystem is threatened through the enrichment of infertile soils, which result in faster soil N-cycling rates. Even after restoration, N-cycling rates may remain elevated. To assess legacy effects on N cycling and the efficacy of current management strategies, we conducted soil sampling in 51 sites to assess net-mineralization and nitrification rates. We hypothesized that N-cycling rates would be lowest in uninvaded sites, intermediate in restored sites, and highest in currently invaded sites. The data confirm the presence of legacy effects, as average net-mineralization rates were lowest in restored sites, 1.8 times higher in uninvaded sites and 2.4 times higher in invaded sites. Average net nitrification rates were also lowest in restored sites, 1.8 times higher in uninvaded sites, and 3.2 times rates in invaded sites. A regression analysis indicated N-mineralization rates decreased with increases since restoration, and N-nitrification rates increased with increases since burn events. The legacy effect of the Black Locust invasion persists in the Albany Pine Bush, and current restoration efforts have been effective in reducing high nitrogen-cycling rates. These findings may serve as an example for restoration efforts in other areas affected by nitrogen-fixing invasive species.

Sun-PM2-C-2

Effects of Carrion Decomposition on Litter Arthropod Assemblages

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Abstract - The role of arthropods in decomposition of vertebrate animals has been extensively studied and is well understood. Nevertheless, though we know what effects arthropods have on decomposition and what they can tell us about time of death, little research has addressed the effects of decomposition of carrion on arthropod assemblages in litter and soil. We studied the effects of carrion decomposition on litter arthropod populations and soil chemistry over an 18-week period in a mixed forest in southeastern Massachusetts. We used Tullgren funnels to extract arthropods from leaf litter, collected 0, 1.5 and 3 m from carrion. We collected soil samples using a soil core and tested for percent carbon, nitrogen and organic matter as well as pH. Non-carrion-associated arthropods were, on average, more abundant than carrion-associated arthropods, but the strength of the effect differed with increasing distance from carcasses and over time. These findings suggest that effects of carrion decomposition on litter arthropods are localized and transient and that the presence of carrion-associated arthropods had little effect on non-carrion associated arthropods abundance at the decomposition site overall.

Sat-AM1-D-3

Conserving and Reintroducing the Marbled Salamander in Northeastern Massachusetts

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Abstract - *Ambystoma opacum* (Marbled Salamander) are rare and declining throughout Massachusetts and are nearly extirpated from the northeastern MA, where they were once widespread. We are conducting research on the habitat preferences and population status of the last large population of Marbled Salamanders in eastern Massachusetts within the Blue Hills Reservation and are poised to begin the first reintroduction of Marbled Salamanders in Massachusetts. Our research will help determine conservation needs for the Blue Hills population, select the best reintroduction sites in the Middlesex Fells, where the species was last observed prior to WWII, and develop effective protocols to raise larvae in captivity prior to release at reintroduction sites.

Sun-AM2-B-4

Communication in the Cacophony of a Treefrog Chorus

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Abstract - Male treefrogs often advertise for mates in dense choruses with high levels of noise and acoustic clutter. Solutions to the noise problem may involve signal production and/or perception. Males of the neotropical *Dendropsophus microcephalus* (Small-headed Treefrog) produce multi-note calls and can rapidly change inter-note timing to reduce call overlap. Adjustments are made selectively such that interference is most effectively reduced among closest neighbors. Males of the North American *Hyla versicolor* (Gray Treefrog) do not seem to exhibit selective attention in a way that reduces call interference between nearest neighbors, and changes made in call rate and duration accompanying increasing noise levels do not help females detect calls. Moreover, there is no evidence of auditory induction, by which the auditory system might perceptually restore masked or missing components of the pulsed calls. Although, under some circumstances, differences in call frequency may help females distinguish among neighboring males, naturalistic spectral differences do not seem to help females perceptually separate the overlapping calls of such males. There is evidence, however, that spatial separation of males can contribute to signal segregation by listening females during acoustic interference. Degradation of the calls of Gray Treefrogs is influenced by habitat characteristics and elevation of the sound-transmission path, which provides a potential explanation for males' preference for higher calling perches.

Sat-PM1-B-2

Why Did the Amphibian and Reptile Cross the Road? Modeling Spatial Patterns of Road Mortality in Southeastern Virginia

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Abstract - The impact of road mortality on biodiversity is a prevalent issue in densely populated regions that is often difficult and expensive to mitigate. Located in southeastern Virginia, Colonial National Park experiences high rates of roadkill due in part to the park's substantial visitation rates and considerable road traffic. Previous research has suggested that hotspots of road mortality, particularly of reptiles and amphibians, are concentrated around specific habitats, such as wetlands. The aim of this study was to determine if similar patterns of road mortality occur in Colonial National Historical Park. We used data collected from 137 aquatic species and 80 terrestrial species encountered during road surveys in 2015, and generated a null model with 137 random points along the roads that were surveyed. We then calculated the distance to the nearest wetland for all points within the 3 groups. We determined that average distance to wetland was significantly lower in aquatic herpetofauna found on road, and also significantly lower than our null model. We concluded that aquatic species road mortality is more concentrated around wetlands compared to randomly generated points, and is far more likely to occur near wetlands compared to terrestrial species road mortality. Management implications related to these results could include the installation of culverts with drift fences along roads to reduce roadkill rates of aquatic species within the park, and implementation of management practices that address "hotspots" of road mortality based on surrounding habitat type.

Sun-PM2-B-4

Impacts of Beaver (*Castor canadensis*) in Suburban Ecosystems: Friend or Foe?

Hillary Siener (Teatown Lake Reservation, Ossining, NY; hsiener@teatown.org)

Abstract - Suburban ecosystems are faced with environmental stressors from development, pollution, invasive species, and overabundant deer. The recent return of *Castor canadensis* (Beaver) to the greater New York City metropolitan area is exciting news after nearly a century of absence, but their impacts further contribute to stress in some suburban environments. The Beavers' ability to alter landscapes may threaten a number of increasingly rare habitats, plants, or animals, and can lead to human-wildlife conflicts. Alternatively, Beaver presence can be beneficial by creating habitats that increase biodiversity and enhance water quality. With a focus on suburban landscapes, I highlight the Beavers' role in ecosystems and weigh the pros and cons of their return to southeastern New York in the context of greater environmental stressors.

Sat-PM2-A-3

Dam Removal as a Tool for River Restoration

Amy Singler (American Rivers and The Nature Conservancy, Northampton MA; asingler@americanrivers.org)

Abstract - Dam Removal is arguably the most effective tool we have for restoring river habitat and fish passage. The Connecticut River watershed alone has over 3000 dams. While some of those dams provide important water supply, flood control, and recreation functions, most no longer serve the original purpose for which they were built. Many dams are relics of old mills and the industrial revolution, are no longer maintained, and are in need of repair. The benefits of many dams may no longer outweigh the significant impacts to fisheries and river habitat. Dam removal restores river habitat and function as sediment, water, nutrients and fish are able to move again unimpeded. Dam removal also eliminates maintenance requirements for owners and the potential danger of failure at unmaintained dams during floods. As the rate of dam removal has increased, we are seeing positive results to fish and river habitat, and we are learning just what it takes to make projects successful.

Sat-PM2-C-1

Temporal Shifts in Carnivore Distribution along Elevational Gradients in New England: An Investigation of the Consequences of Climate Change

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Abstract - Montane boreal forests in New England, ecologically important due to cool climate and older-aged stands with complex structure, define distributional edges for carnivores such as *Martes americana* (American Marten) and *Lynx canadensis* (Canada Lynx). However, predicted declines in snowpack and montane boreal forest habitat due to climate change may fundamentally alter community dynamics. We established 91 remote cameras, programmed to collect climate data, along elevational (335 m–,917 m) and latitudinal (43.9° N–45.3° N) gradients to evaluate the influence of snowpack on carnivore species' distributions for 2 winters. We used data to estimate occupancy for Martens, *Pekani pennanti* (Fisher), *Lynx rufus* (Bobcat), and *Canis latrans* (Coyote). Elevation was the best predictor of occupancy for most species, with maximum snow depth also acting as an important predictor. Martens were positively associated with sites that contained deep snow, whereas Fishers, Bobcats, and Coyotes were primarily detected at low elevations with shallow snowpack during mid-winter. However, as snowpack receded during spring, these generalist carnivores were more frequently detected at high elevations. Our results highlight that changes in snow cover are reverberating through wildlife communities across elevational and latitudinal gradients and that dramatic shifts can occur within a few years. We are increasing sampling in the region to estimate occupancy for additional carnivores, multiple seasons, and changes in phenology, and to reduce confounding among habitat and climate variables.

Sat-AM2-C-4

Alpine Snowbed Communities on Mount Washington and the Invasion of Dandelions

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Abstract - Alpine snowbeds have been shown in European studies to be the alpine community most vulnerable to climate change. They are, moreover, the most species-rich of the many alpine communities on Mount Washington, the highest mountain in northeastern US. These snowbeds also contain rare vascular plants and mosses. We report here on a newly completed 2102–2115 baseline study of snowbeds, and the related rill communities, in the Alpine Garden and lower cone of Mount Washington, including quantitative data on all vascular plants, bryophytes, and lichens. These data will be available to researchers for studies in relation to future climate change. This may not come soon, but there is a more immediate threat. In 2114, Allison Bell discovered that *Taraxacum officinale* (Common Dandelion) had invaded snowbeds in the upper cone of Mount Washington. More invaded snowbeds were found in 2015. The effects of the dandelions are under study, and a removal process has begun. This project has been supported by the Waterman Fund, and several other grantees and volunteers have been involved.

Sun-PM2-D-3

Fit and Fat by Fruit: A Nutritional Study on Migratory Bird Frugivory

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Abstract - Many migratory birds in the northeastern US are frugivorous during their autumn migrations when wild seasonal fruits are abundant at stopover sites. However, different fruits that are available to birds can vary dramatically in their nutritional and biochemical properties, thus making some more-suitable options than others for meeting the energetic challenges of refueling birds. We investigated the nutritional quality of common fruits at an important stopover location for migrating passerines on the south shore of Lake Ontario in Rochester, NY. We sought to investigate nutritional differences in the fruits of native plants compared to those of non-native or invasive plants in the area. We also investigated annual variation in fruit quality related to some environmental conditions and emerging threats to certain native plants, and also and the potential for small-scale spatial variation in fruit quality or biochemical traits. The data on fruit nutrition complement on-going studies of the refueling performance of migrating songbirds at this location. Our comprehensive results suggest that high-quality native fruits are important resources for refueling birds in autumn. Further, the nutritional quality of these fruits may be relevant for the conservation of key stopover sites in light of predicted trends in environmental change and the new landscape available to birds along their migratory paths.

Sun-AM1-C-1

Breeding Season and Larval Development Variability of Pond-breeding Frogs Across New England

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Abstract - We began conducting surveys for amphibians in 5 ponds of the White Mountains in 2007 and since then expanded our research to include study sites at 2 locations in Massachusetts: Wachusett Mountain in Princeton and Squam Farm on Nantucket. Two of the ponds in the White Mountains are just below treeline at approximately 1219 m (4000 ft) in elevation (Eagle and Hermit Lake) and the other 3 are above treeline at approximately 1524 m (5000 ft) in elevation (Lakes of the Clouds includes 2 ponds within 200 feet of one another and Star Lake). I will explain how the amphibian communities vary from pond to pond and sometimes from year to year within the same pond. *Pseudacris crucifer* (Spring Peeper) is the only species that occurs at each study pond across the range and has been reported from the coast to the summit of Mount Washington. *Lithobates sylvaticus* (Wood Frog) is the species most commonly detected in its larval phase at all the mainland ponds. *Anaxyrus americanus* (American toad), *Lithobates clamitans* (Green Frog), *L. catesbeianus* (Bull Frog), *Ambystoma maculatum* (Spotted Salamander), and *Notophthalmus viridescens* (Eastern Newt) have been documented in various densities. Spring Peepers begin calling (breeding) at Nantucket in mid-late March, but are delayed to mid-April at Wachusett Mountain and mid-May to early June in the White Mountains. At the alpine ponds in the White Mountains, we have documented metamorphosis of several species of frogs between the end of July (2012), end of August (2013–2014), and mid-September 2015. The overall greater size of the Wood Frog tadpoles and metamorphs in the White Mountains is likely due to a variety of conditions (temperature, nutrition, predators, shade) and how they influence the biology of the Wood Frogs during the larval developmental period. Although the alpine ponds do not dry up, approximately 90 days after breeding (early September), the decreasing water temperature may reduce amphibians capacity to feed and grow. When Wood Frogs are relieved from the 2 most common threats, fish predators and desiccation, selection favors certain characteristics that are not normally allowed to be expressed in more common ecological settings.

Sun-AM2-B-3

The Legacy of Deer Overabundance: Long-term Delays in Herbaceous Community Recovery

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Abstract - In eastern deciduous forests, decades of *Odocoileus virginianus* (White-tailed Deer) overpopulation have dramatically homogenized plant communities, replacing a diverse herbaceous understory with a few recalcitrant species. The mechanisms preventing recovery of a diverse understory and the time scale at which recovery occurs even after deer densities have been reduced remain poorly understood. Here we experimentally evaluate the legacy of overbrowsing by quantifying the herbaceous understory community response to long-term deer exclosures in a mature beech-maple forest in northeastern Pennsylvania. We also used a 3-year sapling removal experiment to test the mechanistic hypothesis that woody recalcitrant understory layers made up of *Fagus grandifolia* (American Beech) and *Acer* spp. (maple) saplings suppress herbaceous diversity recovery. We found that the herbaceous community recovered surprisingly slowly, failing to increase in diversity even after over a decade of low deer density. However, rare deer-sensitive species did show substantial recovery in the last few years of the study. Removing the woody recalcitrant understory layer increased herbaceous diversity marginally (1–2 species per plot) after 3 years, providing some evidence for woody sapling suppression of herbaceous plants. Recovery of rare species still seems to be heavily limited, demonstrating a decadal-scale time lag between herbivore abatement and understory plant-community response.

Sat-PM2-D-3

A Multicriteria Decision Analysis Approach for Identifying Priority Conservation Areas for Grassland Birds

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Abstract - Land management decisions often entail tradeoffs between biodiversity conservation and agricultural production. However, properly designed and efficiently implemented conservation programs can be used to integrate wildlife and human needs. This research tested the efficacy of multicriteria decision analysis and analytic hierarchy processes in selecting priority areas for grassland bird conservation in human-dominated landscapes in the northeastern US. We created detailed GIS layers of grassland patches using landscape- and patch-level attributes shown to be important in grassland bird habitat selection and conservation decisions. Integrating the GIS dataset into a multicriteria decision analysis framework, we produced maps in which grassland patches were binned into habitat quality categories and used these maps to identify priority conservation areas. The total area in each habitat quality category was more sensitive to changes at the patch level and less sensitive to changes in ranking weights at the landscape level. Two regions with grassland blocks of >100 ha were identified as priority sites that had the highest quality values for grassland birds. This approach resulted in maps that federal, state, and non-governmental managers can use to focus conservation efforts. The integration of GIS with multicriteria decision analysis can serve as a model to help set priorities for land conservation for other species and in other regions.

Sat--A-3

Biodiversity of tropical Sri Lanka: Conservation Outside Protected Area Network and Some Insights on Multilateral Opportunities in Conservation Sciences

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Abstract - The tropical island of Sri Lanka is rich in biodiversity and endemism, especially given the remarkable diversity of freshwater fish and herpetofauna: >90 freshwater fish (~55% endemism), >119 amphibians (~88% endemism), and >215 reptiles (~80% endemism). Despite the geographic disjunction, Sri Lanka and the Northeastern US share much in common: unique herpetofaunal communities, altitudinal gradient of biodiversity, and threats on freshwater. Furthermore, for both regions, biodiversity largely occurs outside the protected areas. Only 1.5% of Sri Lanka's primary forests remain intact. Yet, <10% of the entire land area is under state-legislated protection. One-fifth of Sri Lanka's vegetation cover occurs outside the protected area network, thus subjected to multiples uses (home gardens, plantation agriculture, and timberlands). Our recent surveys revealed that unprotected lands provide habitat for threatened species (amphibians: *Adenomus Kandianus* [Kandyan Torrent Toad]), highly-exploited species (terrapins: *Melanochelys trijuga thermalis* [Sri Lanka Black Turtle] and *Lissemys ceylonensis* [Sri Lankan Flapshell Turtle]), locally-rare wide-ranging species (many lizards: *Calotes liocephalus* [Spineless Forest Lizard], *Lyriocephalus scutatus* [Hump-snout Lizard]). Additionally, >60% nation's avifauna and butterflies have been recorded from rural homegardens. These landscapes can also establish landscape-scale habitat connectivity across multiple ecosystems. Therefore, exploring conservation opportunities outside Sri Lanka's protected area network is foremost in importance. Conservation challenges in tropical Sri Lanka could provide a useful learning opportunities for the Northeastern US. For instance, Sri Lanka's efforts on forest gardening in private lands, riparian corridor conservation, upper catchment conservation, and human-inclusion buffer zones can be applicable to landscape scale conservation in the Northern Appalachian/Acadian ecoregion. Moreover, conservation prioritization schemes applied in Sri Lanka- such as ecological and evolutionary distinctness and extinction vulnerability- can be useful tools to identify conservation targets in the northeastern US.

Sat-AM2-D-4

Droppers of *Erythronium americanum* Grow to Avoid Cold While Finding Nutrients

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Abstract - *Erythronium americanum* (Trout Lily) is a common spring ephemeral in the northeast United States. Its droppers grow into the soil profile to create asexually formed corms at greater depths than the original corm. While this depth helps to prevent mortality, it is not known what cues the corms use to determine to what depths the droppers should grow. I exposed corms to a series of experimental conditions to determine which environmental factors affect dropper growth. These conditions included a control of potting soil, added light, reduced temperature, drought, a nutrient rich layer in sand, and a second control of just sand. Droppers grew the deepest in the cold treatment and were significantly shallower in the nutrient treatment than in the sand control. Droppers, therefore, grew deeper to avoid cold while remaining in a nutrient-rich environment. While causes of mortality in the summer and winter may differ, droppers appear to use temperature and nutrient availability as combined cues for the depth of their growth.

Sun-AM2-D-4

Coastal Breeding Bird Monitoring by Volunteers in Boston Harbor, 2007–2015

Carol Lynn Trocki (University of Rhode Island, Kingston, RI; cltrocki@gmail.com)

Abstract - Boston Harbor Islands National Recreation Area (NRA), established in 1996, includes 34 islands and peninsulas situated within the greater Boston shoreline. In 2002, the Boston Harbor Islands NRA was designated as a Massachusetts Important Bird Area. The Boston Harbor Islands provide habitat for a significant number of colonial-nesting waterbirds, including extensive colonies of *Larus argentatus* (Herring Gull), *Larus marinus* (Great Black-backed Gull), and *Phalacrocorax auritus* (Double-crested Cormorant), 4 mixed-species heronries, and variable numbers of *Sternula antillarum* (Least Tern) and *Sterna hirundo* (Common Tern), both listed as species of special concern in Massachusetts. In addition, the islands provide habitat for over 20 pairs of nesting *Haematopus palliatus* (American Oystercatcher) each year and support a population of over 300 nesting *Somateria mollissima* (Common Eider). Birds are an important component of park ecosystems and sensitive to changes within them. Since 2007, as part of the National Park Service's Inventory and Monitoring Program, volunteers have participated in an annual effort to monitor coastal breeding birds in the park under the guidance of a lead scientist. This presentation will offer a comparison of nesting waterbird numbers among years, consider changes in colony location, and provide a context for comparison to historic data and regional trends.

Sat-PM1-D-4

Northern Copperhead on the Edge

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Abstract - Various surveys of *Agkistrodon contortrix* (Northern Copperhead) populations at and near the very edge of the species range have been ongoing in the Connecticut Valley for over 30 years. Annual reproduction and survivorship suggest that numbers have remained about the same for the past 3 decades and that local expansion of the population via adoption of new dens may be occurring. However, recent appearance of the invasive *Cynanchum nigrum* (Black Swallowwort) has resulted in the need for control at one particular den site where over 95% of the birthing and basking areas became shaded and unusable. Cooperation from State agencies have made significant strides to reducing this threat. Discovery of parthenogenic females just south of this current study site might suggest that this mode of reproduction is at least likely in populations at the edge of their geographic range.

Sun-AM2-B-2

White-tailed Deer in Forested Systems: How Human–Deer Interactions Shape Ecosystem Response

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Abstract - The density of *Odocoileus virginianus* (White-tailed Deer) has been increasing throughout many regions in the United States. Deer have both direct and indirect effects on ecosystems and have the capacity to greatly alter ecosystem structure, composition, and function. Using paired plots at 4 locations with different deer management strategies in Dutchess County NY, we have examined the effect of deer on vegetation density/composition, forest regeneration, soil characteristics, persistence of seed in the seed bank, and earthworm density. Plots at Vassar College showed greater plant diversity and sapling density in fenced areas than in adjacent unfenced areas after 5 years of exclusion. However, plots at other locations indicate that a lack of deer management can significantly impede forest regeneration for decades. Only sites with annual controlled hunts show evidence for forest regeneration. In addition to strong effect on vegetation, we also found that deer-excluded areas had significantly more *Amyntas agrestis* (Asian Jumping Worm) likely due to increased food availability from sapling leaf litter. In contrast, seed-bank data indicate that while deer do not have a significant impact on the persistent seed bank, land-use history does have a large impact on the species composition of seed banks. Our results indicate that deer can have multiple effects on forested systems. Human influence through changes in land use and deer management efforts can greatly alter the strength of these effects.

Sat-PM2-A-4

Flood, Fire, and Plow: The Ecological History of Open Lands in Columbia County, NY

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Abstract - This case study will summarize historical and current information on the ecology and use of Columbia County's open lands (i.e., open wetlands and upland fields). What are some of the main factors that have influenced the value of these lands as habitat for native species and as farm land? Cultural factors, such as clothing fashion, the fuel for and nature of transport, urban food tastes, and real estate desires have affected and continue to directly affect land use. Large-scale ecological changes, such as the 17th–19th century spread of grass-based agriculture and the 20th-century rise of industrialized, high-input farming, while having some direct influence on the County's landscape, also affected the pool of organisms present to colonize the County's open habitats. These factors interacted with the physical and biological "lay of the land" to result in land-cover patterning such as the conversion of some hill fields to forest and then upscale home sites, and the direct conversion of peri-urban fields and orchards into residential developments. In closing, we'll ask what relevance these historical trends have for current conditions and future development, what new factors are appearing (e.g., climate change, high-speed rail), and what monitoring and investigation might help us more consciously guide open land use for agricultural production and for the conservation of certain native species in Columbia County.

Sun-AM2-A-4

Admixture Mapping Identifies Selectively Introgressed Genomic Regions in North American Canids

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Abstract - Hybrid zones typically contain novel gene combinations that can be tested by natural selection in a unique genetic context. Parental haplotypes that increase fitness are likely to introgress beyond the hybrid zone, into the range of the parental species. We use the Affymetrix canine SNP genotyping array to identify genomic regions tagged by multiple ancestry informative markers that are more frequent in an admixed population than expected. We surveyed a hybrid zone formed in the last 100 years as *Canis latrans* (Coyote) expanded their range into eastern North America. Concomitant with expansion, Coyotes hybridized with wolves and some populations became more wolf-like, such that Coyotes in the northeast have the largest body size of any Coyote population. Using a set of 3102 ancestry informative markers, we identify 60 differentially introgressed regions in 44 canines across this admixture zone. These regions are characterized by an excess of exogenous ancestry reflecting selection since hybridization and, in northeastern Coyotes, are enriched for genes affecting body size and skeletal proportions. Further, introgressed wolf-derived alleles have penetrated into southern US Coyote populations. Because no wolves currently exist in this area, these alleles likely originated from intraspecific gene flow rather than directly from hybridization. We show that *Canis lupus* (Grey Wolf) and Coyote admixture has far-reaching effects and, in addition to phenotypically transforming admixed populations, allows for the differential movement and selection of alleles from different parental species to be tested in new genomic backgrounds.

Sat-PM1-A-3

How Eastern Gray Squirrels (*Sciurus carolinensis*) Learn to Navigate Obstacles to Reach Food

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Abstract - Observations of free-ranging *Sciurus carolinensis* (Eastern Gray Squirrels) crossing constructed test obstacles to reach food revealed evidence for multiple types of learning. I presented 88 obstacles to Eastern Gray Squirrels at a residence in New Britain, CT, between October 2014 and June 2015. Squirrels first learned to access a feeder box containing peanuts and hazelnuts. Then I added a ramp leading to the feeder box. Then various obstacles were added between the ramp and the feeder box, including tubes squirrels went over or through, and a spinning “windmill” apparatus; a chain and a rope were also substituted in place of the ramp. After 3 different squirrels each had successfully crossed an obstacle at least 3 times, I added a novel obstacle. Obstacles were only available to squirrels when an observer was present and filming the behavior of each squirrel that contacted the obstacle. Some squirrels were able to traverse novel obstacles on their first attempt; others required multiple attempts (maximum of 34). Longer-duration unsuccessful attempts followed by a quick success provided evidence for possible insight learning. Some squirrels tended to be the first or second squirrel to complete an obstacle, while others consistently completed obstacles only after at least 2 other squirrels had overcome them. Many of the obstacles used in this study mimicked objects squirrels may encounter in natural and urban settings; the rope, for example, is similar to maneuvering across a thin branch or a clothesline. Other obstacles, such as the windmill, would not resemble any object they typically encountered in nature. Squirrels that successfully overcame obstacles after others had already done so typically required fewer trials than the first or second successful squirrel, providing indirect evidence for observational learning.

Sun-AM1-B-1

Occupancy Dynamics and Colonization Patterns of Coyotes in New York City

Mark Weckel (American Museum of Natural History, New York, NY; mweckel@amnh.org) and Christopher Nagy (Mianus River Gorge, Bedford, NY; chris@mianus.org)

Abstract - *Canis latrans* (Coyote) have only recently begun to colonize New York City over the last 2 decades and little is known about their distribution and spatial ecology in one of North America’s most populous urban centers. We used camera traps to monitor several sites across the boroughs of the Bronx, Manhattan, Queens, and Brooklyn to determine the overall distribution, site-specific breeding status (i.e., based on the presence of pups), and seasonal occupancy patterns (i.e., the proportion of all sites being used) of this species from 2011 to 2014. Site occupancy was higher during the non-breeding season than during the breeding season across all 3 years. By 2014, on the mainland borough of the Bronx, Coyotes were established in 6 sites and breeding in 4, up from 2 in 2011. Only a single resident Coyote was found in the island boroughs (Manhattan, Queens, or Brooklyn) from 2011 to 2014. Overall, Coyotes seem to be successfully colonizing suitable greenspaces in the Bronx, as evidenced by the increase in year-round occupancy and the number of breeding sites over the 4 years of the study. While crossing from mainland Bronx to Queens on Long Island appeared to be a significant barrier during our 4 years of surveys, we expect that Coyotes will eventually establish themselves in the island boroughs of NYC as Coyotes more densely populate the Bronx and outward dispersal pressure increases.

Sat-PM1-A-5

Monitoring Migration of Alpine Plants: A GLORIA Site in the White Mountains, NH

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Abstract - Alpine plants are generally expected to migrate upslope in response to a warming climate, and are believed to be particularly sensitive to climate change. They are especially vulnerable in the Northeast, due to their rarity and potentially shrinking habitat. In 2014, an international team of researchers established a Global Observation Research in Alpine Environments (GLORIA) site in the White Mountains of New Hampshire and collected baseline data. The protocol is designed to record composition of summit alpine vegetation and enable quantitative analysis of shifts in species’ composition in the future. It has been implemented at 126 other alpine research sites around the world, but this is the first site in the eastern United States. The methods and preliminary results from permanent plots on 4 different summits in the White Mountains will be presented. The presentation will cover some of the challenges in adapting this international protocol locally, and the likelihood of establishing additional GLORIA sites in other Northeast alpine regions. The presentation will also discuss different migration models and review data from other GLORIA sites from around the world, as a way of understanding how alpine plants in the Northeast may react to climate change.

Sun-PM2-D-2

Slimy Sculpin Movement Before and After Dam Removal

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Abstract - Massachusetts contains approximately 3000 dams, which were built for flood control, hydropower, to provide water for citizen use, and to power mills. With about 90% of these dams no longer functioning in their intended capacity, focus has recently been turned to their removal. Dam removal is beneficial for human safety and aquatic ecosystem health. Many dam-removal efforts highlight the potential for restoring connectivity for fishes, particularly diadromous fish that require long movements along river corridors to complete their life cycle. In contrast, few studies have focused on benefits of dam removal on movement of non-anadromous fish, despite the importance of small-scale movements for population persistence. In December 2014, the Fall River Dam in Gill, MA, was removed to increase fish passage and restore natural stream and sediment flow. We examined the impact of this dam and dam removal on movement patterns of *Cottus cognatus* (Slimy Sculpin), a non-anadromous, cold-water fish. We collected fish from four 50-m reaches below the dam and three to four 50-m reaches above the dam in the fall of 2014 and 2015. We used a genetic approach, the sib-split method, to identify the presence of full siblings on either side of the barrier and make inferences about movement patterns. We expect to find increased movement following dam removal, with more full siblings in reaches closer to the old dam site (e.g., within 50 m) than farther away (e.g., 100–200 m). Our results will help to understand the impacts of barriers on population connectivity of non-anadromous fish, and may be used to guide dam-removal decision-making.

Sat-PM2-C-2

The Role of White-tailed Deer in Spreading Invasive Plants and Preventing Native Plant Regeneration

Scott C. Williams (The Connecticut Agricultural Experiment Station, New Haven, CT; scott.williams@ct.gov) and **Jeffrey S. Ward** (The Connecticut Agricultural Experiment Station, New Haven, CT; jeffrey.ward@ct.gov)

Abstract - While both invasive species and herbivory by *Odocoileus virginianus* (White-tailed Deer) are recognized as locally important drivers of plant community dynamics, few studies have examined their interactive effects on plant community structure and dynamics. We examined this interaction over 7 growing seasons after initial invasive control treatments for 9 herbaceous and shrub guilds: annuals/biennials, short perennial forbs, tall perennial forbs, ferns, graminoids, native woody shrubs, invasive shrubs, native woody vines, and invasive woody vines. Invasive shrubs were either treated 3 times (cut in March, then directed flame of new ramets in July and October), once (cut in March), or were not treated. A 2.3-m fence protected half of each treatment area from herbivory. Cover of annuals/biennials and short perennial forbs was higher where invasive shrubs were controlled, and excluding herbivory increased invasive vine cover. Both invasive control and White-tailed Deer exclusion increased cover of native shrubs and tall perennial forbs. We saw no evidence of synergistic treatment interactions for any guild. The apparent antagonistic interaction of shrub control and White-tailed Deer exclusion on graminoid cover was likely a secondary effect of exclusion, which increased cover of native shrubs and tall perennial forbs that shaded out shorter graminoids. Our results suggest that White-tailed Deer at high densities function as keystone herbivores that create underutilized growing space by intensively browsing susceptible native species. Invasive shrubs initially establish in degraded systems and become predominant because they are more tolerant of herbivory than native species. Once invasive shrubs have formed well-established thickets, they can quickly recover from a disturbance that kills all aboveground tissues—regardless of whether herbivore pressure is high or absent. These recalcitrant thickets severely limit growth of shorter-stature species by capturing most available light. Until the introduction of effective biological controls, it is likely that invasive shrubs will continue to dominate sites where they are established and will continue to spread across the landscape.

Sat-PM2-D-1

Where Have all the Eelgrasses Gone? Potential Causes of Decline in Frenchman Bay?

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Abstract - Eelgrass (*Zostera marina*), a key component of the marine ecosystem, has been declining in the upper Frenchman Bay since 2007, and in 2013 suffered a complete loss both in restored sites and surrounding naturally occurring Eelgrass areas. To complement and help guide restoration efforts, we wanted to understand the causes of decline. In this study, we aimed to determine if there was any correlation between plant stress, whether biotic (e.g., disease) or abiotic (e.g., heat stress or general stress), and the recent decline. We collected 10 eelgrass samples from each of 3 sites varying in eelgrass health and bed exposure (depth). Following RNA extraction and reverse transcription, I used real-time quantitative PCR to compare among the 3 sites the levels of expression of 3 stress genes known to modulate the responses of plants to heat, disease, and/or general stress. Here, I report normalized gene expression from the 3 sampled sites and explore possible correlations between biotic and abiotic stress, the health and status of the beds, and local eelgrass decline.

Sun-AM2-D-3

Cameras, Caterpillars, and Conservation: How to Champion Insects One Photo at a Time

Ellen Woods (Wesleyan University, Middletown, CT; ewoods@wesleyan.edu)

Abstract - Renowned entomologist Dr. Thomas Eisner said, extending the adage that an image is worth a thousand words, “It sometimes takes only one photograph to save a species.” With unprecedented rates of extinction, we are losing insect species faster than we can describe them. Before a species can be saved, however, it must usually first capture the public’s attention. Many charismatic species of birds and mammals have become iconic, and thus the targets of conservation, in part because of the captivating work of photographers. Insect conservation would benefit from more compelling imagery, yet it is relatively lacking. Insects are difficult to photograph given their scale, and many species are seldom photographed due to their rarity or inconspicuous nature. Knowledgeable naturalists equipped with cameras have some of the greatest potential to generate high-quality images that can both showcase the often less-venerated insects and provide valuable data to scientists. This presentation will cover photographic methods to produce imagery that is both aesthetically pleasing and visually informative with an emphasis on photographing caterpillars with a dSLR camera.

Sun-PM2-A-1

Nutrient Resorption in *Larix laricina* Along Environmental Gradients in an Adirondack Wetland

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Abstract - Plants may reduce their dependence on external nutrient-availability in the environment by retranslocating nutrients contained within leaves and storing them before senescence. Resorption of nutrients from leaves prior to senescence conserves critical nutrients which would otherwise be lost back to the environment. In nutrient poor, sphagnum dominated, wetlands, such a strategy means less uptake is required during the next growing season. Eastern Larch (*Larix laricina*) is known to typically resorb nitrogen at rates higher than most evergreen and deciduous trees, but little is known about fine-scale correlations between nutrient resorption and environmental gradients. Our study examined nutrient resorption in needles from 28 Eastern Larch saplings in plots across gradients of depth to groundwater, water temperature, dissolved O₂ content, pH, conductivity, and percent canopy closure. We measured levels of N, P, Ca, Mg, B, Cu, K, Na and Mn, in needles collected at the end of peak growing season and immediately before senescence. Initial needle nutrient content, and resorption efficiency and proficiency were determined for this suite of micro- and macronutrients and correlated with abiotic variables. Preliminary results showed no significant patterns in P resorption along abiotic gradients. However, N-resorption proficiency was positively correlated with canopy closure, while Cu- and B-resorption proficiency were negatively correlated with canopy closure. K- and Na-resorption proficiency were negatively correlated with depth to groundwater. These findings suggest that the status of these nutrients in Eastern Larch and the physiological processes in which they are involved may be influenced by these abiotic gradients at spatial scales of tens of meters.

Sun-AM1-A-3

Small-Dam Impacts to Stream Temperature and the Potential Consequences for Aquatic Biota

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Abstract - New England has the highest density of dams of any region in the United States, and most of the region's 11,600 dams are small, surface-release structures. Past research on the effects of small dams on temperature has varied results; some studies report surface-release dams increase downstream temperatures over many kilometers, while others have found no effect on stream temperatures. We quantified the impacts of small, surface-release dams on stream temperature at 31 dam sites in Massachusetts. Of the 16 sites that had upstream reference temperatures, 75% (12 sites) had elevated downstream temperatures (0.07–4.67 °C increase) relative to upstream temperature. Twenty-five of the 31 sites showed a linear decline in temperature for 45–1765 m downstream of the dam, with the rate of decline varying among sites. Downstream temperatures at nearly all of these sites exceeded average summer (June–August) temperatures of 21.7 °C, which has been shown to be an upper temperature threshold for coldwater species such as trout and sculpin. These increased temperatures can cause thermal stress to aquatic organisms, particularly during summer months, and ultimately lead to local extirpations of sensitive species. Dam-induced temperature increases may also affect organisms that use temperature as a biological cue (e.g., for migration, spawning, and egg hatching). Our research shows that dam removal can be a viable option for restoring natural temperature regimes to streams, re-establishing diminishing coldwater habitat, and providing a benefit to thermally stressed aquatic biota.

Sat-PM1-C-3