

# Oral Presentation Abstracts

Listed alphabetically by presenting author. Presenting author names appear in bold. Code following abstract refers to session presentation was given in (Day [Sun = Sunday, Mon = Monday] – Time slot [AM1 = early morning session, AM2 = late morning session, PM1 = early afternoon session, PM2 = late afternoon session] – Room – Presentation sequence. For example, Mon-PM1-B-3 indicates: Monday early afternoon session in room B, and presentation was the third in sequence of presentations for that session. Using that information and the overview of sessions chart below, one can see that it was part of the “Species-Specific Management of Invasives” session. Presenters’ contact information is provided in a separate list at the end of this document.

## Overview of Oral Presentation Sessions

SUNDAY MORNING	<b>SUNDAY APRIL 14, 2013</b>			
8:30–10:00	<b>Concurrent Sessions - Morning I</b>			
	Room A	Room B	Room C	Room D
	<b>Ant Ecology I</b>	<b>Cooperative Conservation: Working Together to Reintroduce and Establish Species</b>	<b>Regional (Multi-state) In-situ Reptile/Amphibian Conservation</b>	<b>Breeding Ecology of Songbirds</b>
10:45–12:40	<b>Concurrent Sessions - Morning II</b>			
	Room A	Room B	Room C	Room D
	<b>Hemlock Woolly Adelgid and New England Forests</b>	<b>Marine Ecology</b>	<b>Urban Ecology</b>	<b>Bird Migration and Ecology</b>
2:00–3:52	<b>Concurrent Sessions - Afternoon I</b>			
	Room A	Room B	Room C	Room D
	<b>Natural History and Trends in Northern Animals</b>	<b>A Cooperative Effort to Identify and Report Newly Emerging Invasive Species in the CT River Watershed</b>	<b>Impacts on Biodiversity of Hydraulic Fracturing for Natural Gas</b>	<b>Use of Telemetry for Study of Aquatic Ecosystems</b>
4:20–5:30	<b>Concurrent Sessions - Afternoon II</b>			
	Room A	Room B	Room C	Room D
	<b>Natural History and Trends in Northern Plants</b>	<b>Approaches to Invasive Species Management</b>	<b>Reptile and Amphibian Conservation</b>	<b>Northeastern Pine Barrens I</b>

MONDAY MORNING	<b>MONDAY APRIL 15, 2013</b>			
8:30-10:00	<b>Concurrent Sessions - Morning I</b>			
	Room A	Room B	Room C	Room D
	<b>Forests, Climate Change, and Disturbance Ecology</b>	<b>Ant Ecology II</b>	<b>Conservation, Outreach, and Citizen Science</b>	<b>Fire Ecology</b>
10:45-11:55	<b>Concurrent Sessions - Morning II</b>			
	Room A	Room B	Room C	Room D
	<b>Northern Plants and Climate Change</b>	<b>Large-Scale Management of Invasive Species</b>	<b>Cooperative Conservation: Working Together Through Citizen Science</b>	<b>Northeastern Pine Barrens II</b>
2:00-3:52	<b>Concurrent Sessions - Afternoon I</b>			
	Room A	Room B	Room C	Room D
	<b>Eastern Alpine Biodiversity</b>	<b>Species-Specific Management of Invasives</b>	<b>Freshwater and Wetland Ecology</b>	<b>Historical Ecology of the Northeast US</b>
4:00-5:50	<b>Concurrent Sessions - Afternoon II</b>			
	Room A	Room B	Room C	Room D
	<b>Bee Ecology</b>	<b>Plant Ecology</b>	<b>Animals, Climate, and Calcium</b>	<b>Impact of Climate Change on Migratory Songbirds</b>

## **Prairie Warbler Nest-Site Selection, Nest Survival, and Demographic Response to Management**

**Michael E. Akresh** (Department of Environmental Conservation, University of Massachusetts Amherst, Amherst, MA; makresh@eco.umass.edu), **David I. King** (Department of Environmental Conservation, University of Massachusetts Amherst, US Forest Service, Northern Research Station; dking@fs.fed.us), and **Robert T. Brooks** (US Forest Service, Northern Research Station; rtbrooksret@gmail.com)

As shrubland bird populations decline, there is a critical need to understand the effects of habitat management on population demographics and nest survival. We studied a population of color-banded Prairie Warblers (*Setophaga discolor*) between 2008–2012 in a Massachusetts inland, Pitch Pine-Scrub Oak barren consisting of persistent, newly created, succeeding, and disturbed habitats. We present data showing that the abundance and population structure at this site appears to be a function of colonization of newly created habitat by second-year birds, which are likely excluded from mature early-successional habitat by site-faithful older birds. Breeding season fecundity did not differ significantly between newly created and mature habitats. Birds displaced by mowing or fire dispersed to nearby suitable habitat the following year, had relatively similar reproductive success, and did not negatively affect pairing or reproductive success in adjacent areas. Our findings are novel in that they demonstrate the demographic consequences of shrubland management as well as the mechanisms for how management benefits shrubland bird populations. We also examined Prairie Warbler nest-site selection and nest survival in relation to plant leafing phenology, distance to fire breaks and roads, and other factors. Prairie Warblers selected distinct nest sites, such as nesting closer to fire breaks and roads than random sites, and these selected nest sites often increased nest survival. Plant leafing phenology influenced nest-site selection and nest survival in this system; its effects on birds should be considered as a potential mechanism by which bird communities can be affected by global climate change.

Sun-AM1-D-1

## **Nest Relocation of the Slavemaking Ants *Formica subintegra* and *F. pergandei***

**Jennifer L. Apple** (SUNY Geneseo, Geneseo, NY; applej@geneseo.edu), **Sara L. Lewandowski** (University of Massachusetts Medical School, Worcester, MA, SaraLynn.Lewandowski@umassmed.edu), and **Jeffrey L. Levine** (SUNY Geneseo, Geneseo, NY, jll15@geneseo.edu)

Nest relocation in ants may be driven by a variety of factors. The nest movements of slavemaking ants have been noted anecdotally, and in recent studies, such relocations were primarily attributed to nest deterioration or shifts to overwintering locations. Four summers of monitoring the raiding behavior of 11–14 colonies of the slavemakers *Formica subintegra* and *F. pergandei* revealed relatively frequent nest movements: of 14 colonies that have been tracked for at least two of four years, all but one moved at least once by invading existing host nests. Colonies moved as frequently as 6 times in one season, though only one move per season was more typical (mean = 1.9 among mobile colonies). Total distance moved per season ranged from 4.4 m to 129 m, and the longest single migration event was 80.5 m (mean = 23.63 ± 17.67). Movements tended to occur in the middle of the raiding season and were typically followed by continued raiding of nearby host colonies, suggesting that moves were motivated by the availability of host colonies to exploit as sources of slaves. Transport of brood, adult slavemaker workers, adult host workers, and queens was almost entirely carried out by the slavemaker workers. Nest movement is likely an important component of the ecology of slavemaking ants that contributes to the dynamic nature of their interaction with the host ant population.

Sun-AM1-A-4

## ***The Sedges of Maine: A Field Guide to the Cyperaceae Project Overview***

**Matt Arsenault** (Stantec Consulting, Topsham, ME; matt.arsenault@stantec.com), Glen Mittelhauser (Maine Natural History Observatory, Gouldsboro, ME, purplesandpiper@gmail.com), Don Cameron (Maine Natural Areas Program, Augusta, ME, Don.S.Cameron@maine.gov), Alison Dibble (University of Maine, Orono, Maine, adibble2@gmail.com), Arthur Haines (New England Wildflower Society, Framingham, MA, arthurhaines@wildblue.net), Sally Rooney (Blue Hill, ME, sallycrooney@gmail.com), and Jill Weber (Bar Harbor, ME, jillweber@myfairpoint.net)

*The Sedges of Maine: A Field Guide to the Cyperaceae* is a semi-technical field guide to the 224 Cyperaceae species documented from Maine. Through the use of detailed species descriptions and multiple high-resolution digital images for each species, we present a complete document that maintains scientific accuracy and is accessible for users of all levels of botanical expertise. We use a combination of dichotomous and partial keys supplemented with thumbnail-sized images to allow the user to efficiently and accurately identify an unknown specimen. We rely heavily on our own personal field observations to describe each species, characterize the associated habitats, and articulate differences between similar species. We expect this guide to be a welcomed complement to technical floral manuals in Maine, New England, and beyond. In this presentation, we will summarize development of the guide, using the field keys, and the layout of the species pages.

Mon-PM2-B-2

## ***The Effect of Temperature and pH on the Growth of Variable-leaf Milfoil (*Myriophyllum heterophyllum*)***

**Claire Baker** (Paul Smith's College, Paul Smiths, NY, cbaker2@s.paulsmiths.edu), Michelle Berrus (Paul Smith's College, Paul Smiths, NY, h2obest invention@hotmail.com), Celia Evans (Paul Smith's College, Paul Smiths, NY, cevans@paulsmiths.edu), and Daniel Kelting (Paul Smith's College, Paul Smiths, NY, dkelting@paulsmiths.edu)

A fundamental part of invasion biology is the prediction of the potential spread of invasive species. This is due to the negative ecological, economic, and human-health effects that invasive species may cause. Variable-leaf Milfoil (*Myriophyllum heterophyllum*), a newly listed invasive species to the Northeast (since 2009), is native to southern US states from Florida to New Mexico, and has since spread to North Dakota and southwestern Quebec, without becoming invasive to those areas. Variable-leaf Milfoil (VLM) is spreading in the Adirondack Park in northern New York, and its invasive potential is unknown. Based on the geographic distribution of native VLM in some warmer lakes with alkaline waters, it is reasonable to hypothesize that increased temperature, predicted by current climate change models, combined with a low pH in Adirondack lakes would likely increase the growth of VLM. This study examines whether temperature and pH have an effect on the growth of VLM. In this laboratory experiment, the growth of 80 VLM fragments was examined in warm (33.1275°C) and cool (23.135°C) temperatures, combined with 10 pH treatments. Contrary to our hypotheses, there was no significant effect of pH on VLM growth or biomass allocation. Additionally, total biomass growth and allocation to lateral growth were significantly greater in the cool water treatment. We can conclude from our data that VLM vigor is relatively unaffected by pH, but is reduced by water temperatures in the upper range of what might be expected under a climate change warming scenario.

Mon-PM1-B-2

## **Field Notes on “The Danger Plants”: Management of Wild Parsnip and Giant Hogweed in Vermont**

**Michael Bald** (Got Weeds?, Royalton, VT, choosewiselyvt@gmail.com)

*Pastinaca sativa* (Wild Parsnip) and *Heracleum mantegazzianum* (Giant Hogweed), both of the family Apiaceae, are non-native herbaceous plants notoriously dangerous to human eyes and skin. The combination of plant sap, ultraviolet light, and sweat can lead to a burning phytophototoxic reaction affecting humans and reportedly other mammals as well. Numerous projects are underway in Vermont to manually eradicate populations of these two species; some sites are small while others are quite large at three or more acres. Due to a seedbank life of from four to ten years, the projects are long-term in nature. This presentation will share results and data from a Giant Hogweed control project entering its seventh year, a first-year Giant Hogweed project, and several Wild Parsnip projects in either their first or second year of treatment. Manual control is the method of choice on these impacted sites largely due to their complexity, their proximity to water, and the desire to re-vegetate the landscape with native species. A shared philosophy on land stewardship factors into the non-chemical approach as well. The work on all sites has been funded either by landowners directly or by towns. There is a demonstration value not only in the success of treatment across manmade boundaries involving several ownerships, but also in the non-chemical approach over an extended timeframe.

Mon-PM1-B-3

## **Summer Science in Vermont: A Student Action with Significant Impacts**

**Michael Bald** (Got Weeds?, Royalton VT, choosewiselyvt@gmail.com)

As an outdoor classroom, the Pomfret Elementary School site in central Vermont presents impressive opportunity, with its brook, an open field, a garden area, and a forest in its various stages. The students know this ground like the backs of their hands: think idyllic “power spots”. But an invasive species assessment reveals the silent invasion currently underway. Old openings are already dominated by *Elaeagnus umbellata* (Autumn olive), while the edges and the understory are suffering colonization at the hands of several non-native species. The site has its complexities, but it also has no significant safety issues, a capable and curious array of students nearby, and a school board interested in offering children a summer activity. This unusual combination, where the needs of an impacted site are suitably matched to resources at the scene, allowed for development of the Summer Science program in 2011. While the successes of the control project have been measurable, additional positives are emphasized in Summer Science. The student participants discuss data collection, spreadsheet design, weed-dispersal strategies, and the approaches to a management plan. They explore the online iMAP Invasives database, they learn that safety is never less than the first priority, and they present on their work to town organizations. This presentation will summarize the control work addressing *Alliaria petiolata* (Garlic Mustard) and *Berberis thunbergii* (Japanese Barberry) on the school property, highlighting the role of the students and the aspects most compelling to them.

## **Ant Species Diversity in Burned Versus Unburned Sandplain Forest in Vermont**

**Valerie S. Banschbach** (Saint Michael's College, Colchester, VT; vbanschbach@smcvt.edu) and Emily Ogilvy (Saint Michael's College, Colchester, VT; eogilvy@smcvt.edu)

Understanding the response of ant communities to disturbances such as burns can allow us to use ants as indicators of ecosystem health. The aim of this study was to compare ant species diversity in sandplain forest subject to controlled burns in 1995 and 1998 to ant species diversity in sandplain forest that has not burned in the last few decades. Sandplain forest is characterized by Pitch Pine, oak, and heath vegetation; this forest requires periodic burning for regeneration of the native plant community. Insect specimens were collected from the Vermont Army National Guard Base at Camp Johnson, in Colchester, VT, which houses one of the largest remaining parcels of sandplain forest in Vermont. The Vermont Army National Guard has worked to manage the forest for its long-term conservation. Pitfall traps were the main means of insect collection for 2006 through 2008. After identifying 1755 individual ants collected in more than 900 traps, we found a total of 29 species in the burned area and 13 species in the control. The number of ants per trap was highest, on average, for the burned area (2.52 ants/trap) compared to the control (0.59 ants/trap). Rarefaction analysis showed greater species diversity in the burned area compared to the control. The Shannon index of diversity was also higher each year for the burned area than for the control. Ant diversity is impacted by changes in the ecosystem, including changes in soil composition and vegetation, that occur during post-burn forest succession, and ant diversity has an impact on forest succession because the niches that the ants fill are essential to shaping the forest ecosystem. Ongoing work will assess ant species diversity during the course of succession starting from the days immediately after an upcoming controlled burn at this same forest site.

Sun-AM1-A-1

## **A Survey of Ants in Three of New York's Inland Pine Barrens and Sand Plains**

**Grace Barber** (University of Massachusetts Amherst, Amherst, MA; gracebarber.w@gmail.com)

Inland pine barrens and sand plains are globally rare ecosystems. They harbor unusual assemblages of organisms, partly because the well-drained, sandy soils lead to increased local temperatures and susceptibility to fire. Once covering tens of thousands of acres in New York State, these habitats have been reduced to isolated patches due to the encroachment of forests, human development, and fire suppression. The largest of these patches, typically not much more than a few thousand acres, are actively restored and maintained through management practices including tree removal, mowing, herbicide application, and, in some instances, controlled burns. However, despite the importance of the soil characteristics for the functioning of these ecosystems, little is known about the soil biota or its response to management. Ants are important decomposers, seed dispersers, herbivores, predators, prey and soil mixers, and have been successfully used as biological indicators of ecosystem health and recovery in other systems. On the other hand, invasive ants can cause dramatic ecosystem disruption and economic loss. In order to gather preliminary data on New York pine barrens and sand plains ant communities, I used pitfall traps, bait traps, and hand-collection methods to survey ants at six sites located across three preserves in New York State. Species richness ranged from 10 to 22 species at the site level and 15 to 27 species at the level of the preserve. Additional captures from parts of these preserves beyond the six defined sites inflated the number of species for the preserves to 20, 29 and 30 for the Rome Sandplains, the Wilton Wildlife Preserve, and the Albany Pine Bush Preserve, respectively. At the Wilton Wildlife and Albany Pine Bush Preserves, I collected rare and pine-barrens-associated ant species, suggesting that there may be an opportunity to use ants as indicators of management and restoration success in these ecosystems.

Sun-AM1-A-2

## **Invasive Plant Dispersal along the New Corridors of Shale Gas Extraction**

**Kathryn Barlow** (The Pennsylvania State University, University Park, PA; kmb513@psu.edu), **Patrick Drohan** (The Pennsylvania State University, University Park, PA), **Ashley Hayes** (The Pennsylvania State University, University Park, PA), and **David Mortensen** (The Pennsylvania State University, University Park, PA)

The vast network of well pads, compressor stations, access roads, and pipelines developed for natural gas extraction in the Marcellus shale is fragmenting the natural landscape across the Mid-Atlantic. New edges carved into forests and fields to make way for the extraction infrastructure are hypothesized to facilitate the spread of invasive plants, exacerbating the problem in currently invaded areas and creating new corridors for invasion in less-disturbed settings. During the summer of 2012, we conducted a study to document the presence and extent of invasive exotic plants spread around well pads in the Pennsylvania State Forest system. Landscape fragmentation information for each pad locale was derived from aerial imagery in ArcGIS to identify characteristics of the forest sites that may help explain the current state of invasion. Sixty-seven well pads distributed across four Pennsylvania State Forests (Tioga, Tiadaghton, Sproul, and Hyner Run) and the Allegheny National Forest were selected. For each pad, the abundance of a predefined list of 23 invasive exotic plants was recorded along the roads approaching the pad entrance (starting 0.5 km before the pad entrance), and around the pad perimeter (a band approximately 10 m from the gravel edge of the pad into the surrounding landscape). Overall, 60% of pads surveyed were invaded by at least one invasive exotic plant. Of those pads invaded, 45% harbored three or more species and 20% had individual species at abundance levels between 100 and 1000 plants around the pad perimeter. Invasive plant abundance along roads approaching the pad was a positive indicator of invasive plant abundance around the pad. The extent of prior disturbance (more edge) in the pad locale was also a factor explaining the current state of invasion around the pads. Differing seed dispersal mechanisms, such as spread by wind versus bird, and secondary dispersal such as movement by vehicle tires, likely play a role in the varying presence and abundance levels seen in species' movement from nearby roads to the pad. The data collected will serve as a baseline to monitor the long-term effects of disturbance related to natural gas extraction on invasive plant abundance. The landscape fragmentation analysis as it relates to invasive spread is being explored as an invasion prediction model for this type of large-scale human disturbance. A greater understanding of how these new corridors through the landscape act as avenues for invasive plant encroachment is essential for creating best management practices to prevent future spread.

Sun-PM1-C-1

## **Prevalence of Hematozoa in Rusty Blackbirds (*Euphagus carolinus*) on its Breeding and Winter Grounds**

**William Barnard** (Norwich University, Northfield, VT; barnard@norwich.edu)

*Euphagus carolinus* (Rusty Blackbirds) have declined precipitously over the past thirty years across North America. As part of a larger effort to understand this decline, blood samples were taken from Rusty Blackbirds on their breeding and wintering grounds to determine the level of blood parasites. The prevalence (percent infected) in Alaska was 47% ( $n = 36$ ). A sample of Rusty Blackbirds from Maine in 2007 was 67% ( $n = 12$ ). *Leucocytozoan*, *Plasmodium*, and *Trypanosoma* were identified. Overall prevalence of blood parasites during the winter months for the three years was 48% in Mississippi and Arkansas, 45% in South Carolina, and 43% in Kentucky. This level of infection was much higher than was expected. Winter months are generally periods of non-transmission, and the blood parasites are generally absent from the peripheral circulation. *Leucocytozoan* was the most commonly encountered parasite during the winter, followed by *Haemoproteus*, microfilaria sp., *Trypanosoma*, and *Plasmodium*. The high prevalence of haematozoa in overwintering Rusty Blackbirds might suggest that a nonseasonal relapse has occurred. Stress is known to impact the immune response and trigger non-seasonal relapses.

Sun-AM2-D-5

## **Patterns of Forest Plant Endemism in Eastern North America: Implications for Conservation in a Warming World**

**Jesse Bellemare** (Smith College, Northampton, MA; jbellema@smith.edu), **David A. Moeller** (University of Minnesota; moeller@umn.edu), and **Jessamine Finch** (Smith College; jessamine.finch@gmail.com)

Climate change is projected to be a top threat to biodiversity in coming decades. Among vulnerable species, small-ranged endemics are thought to be at the greatest risk of extinction because shifting climate may rapidly leave them exposed to novel abiotic conditions across the entirety of their geographic ranges. In this study, we investigated the biogeographic distribution of 189 small-ranged forest herb species in eastern North America to identify biodiversity hotspots and consider their vulnerability to changing climate. To assess how closely the performance of small-ranged species is linked to unique conditions within their native ranges, and to test how they might respond to proposed conservation measures like "managed relocation" that would involve large-scale translocations to mitigate the effects of climate change, we also initiated a field-based experiment testing the performance of the southern Appalachian endemic forest herb, *Diphylleia cymosa* (Umbrella-leaf), within and beyond its native range, including sites in the Northeast,  $\approx 1000$  km beyond the species' northern range edge. In our biogeographic analysis, we documented high concentrations of endemic forest herbs in the southern Appalachian Mountains, but very few small-ranged species further north in formerly glaciated regions. These patterns suggest that the distribution and diversity of forest herbs in eastern North America still reflects the impacts of past climate change and glaciation, and that many species may be slow to respond to rapid changes in climate. In our ongoing field experiment, we have documented high rates of seed germination outside the native range of *D. cymosa*, as well as high juvenile growth rates over 4 years, although survival has been lower than that documented in control plots within the native range. Current trends suggest that *D. cymosa* may be capable of establishing and reproducing in forest habitats far beyond its native range, making "managed relocation" a plausible option for this endemic species, should conditions deteriorate within its native range in the southern Appalachian Mountains.

Mon-AM2-A-1



## **Nutrient Uptake Efficiency Ameliorates Limited Access Time to Nutrients in an Intertidal Seaweed**

**Kylla M. Benes** (Marine Science Center - Northeastern Univ., Nahant, MA; benes.k@husky.neu.edu), **Valeri Perini** (Marine Science Center - Northeastern Univ., Nahant, MA; perini.v@husky.neu.edu), and **Matthew Bracken** (Marine Science Center - Northeastern Univ., Nahant, MA; m.bracken@neu.edu)

All organisms must acquire and maintain critical levels of nutrients for growth and survival. In rocky intertidal communities, seaweeds may experience nutrient limitation due to reduced submergence time along the intertidal gradient and thus may exhibit adaptations to ameliorate limited access to ambient nutrients. We measured ambient nitrate concentrations ( $\text{NO}_3^- \mu\text{mol L}^{-1}$ ) and tissue nitrogen concentrations (%N) of *Fucus vesiculosus* across its intertidal range at sites throughout the Gulf of Maine and for one year in the southern Gulf of Maine (GoM). In order to assess intraspecific competitive abilities for nutrient uptake, we estimated the nitrate uptake kinetics of high- and low-shore *F. vesiculosus* using a laboratory nitrate uptake experiment. We found minimal differences in tissue %N between high- and low-shore *F. vesiculosus* across sites and time in the GoM (max range = 0.67–2.63 %N) despite a high degree of variation in ambient nitrate availability (max range = 0.48–9.32  $\text{NO}_3^- \mu\text{mol L}^{-1}$ ). High-shore *F. vesiculosus* had significantly greater uptake efficiency compared to low-shore *F. vesiculosus* ( $0.88 \pm 0.07$  and  $0.65 \pm .05$ , respectively) and higher uptake rates across the range of ambient nutrient concentrations observed in the GoM. Greater uptake rates and efficiency, along with other physiological adaptations, may ameliorate nutrient-limitation stress associated with reduced access time to ambient nutrients. Our study provides insight into the physiological mechanisms that allow for a wide intertidal distribution and maintain nutrient concentrations at the base of marine food webs.

Sun-AM2-B-2

## **Introducing the Cooperative Effort to Identify and Report Newly Emerging Invasive Plant Species in the Connecticut River Watershed**

**Cynthia Boettner** (Silvio O. Conte National Fish and Wildlife Refuge, Sunderland, MA; cynthia\_boettner@fws.gov)

Locating and managing invasive species before they have a chance to become established and cause harm is an emerging priority in the Connecticut River watershed. The hope is that we can avoid the next new threats to the health of our ecosystems and the ecological and economic costs involved with rehabilitating heavily infested sites. We are approaching this challenge by developing partnerships with federal, state and local governments as well as non-profits, businesses and individuals in an initiative spearheaded by the Silvio O. Conte National Fish and Wildlife Refuge and funded in part by a grant from the National Fish and Wildlife Foundation. Together we are working to identify priority areas for early detection work, developing lists of newly emerging plant species for regions of the watershed, and providing educational workshops on how to identify those species and a protocol for reporting them. Thus, the goal of this initiative, in creating and supporting Cooperative Invasive Species Management Areas, is to engage citizen scientists and various partners in all phases of invasive species management.

Sun-PM1-B-1

## **Spatial Ecology of the Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*) in Wellfleet Harbor, MA: Assessing Impacts from Coastal Dredging**

**Matthew G. Bolus** (UMASS, Amherst, MA, mbolus@eco.umass.edu), Theodore Castro-Santos (USGS-S.O. Conte Anadromous Fish Research Center, Turners Falls, MA, tcastro\_santos@usgs.gov), and Andy Danylchuk (UMASS, Amherst, MA, danylchuk@eco.umass.edu)

*Malaclemys terrapin terrapin* (Northern Diamondback Terrapin) is at the northern limit of its range along the shores of Cape Cod, MA and is a state listed threatened species. In spite of this status, little is known about its spatial ecology in this region, including the distribution of brumation sites. Brumation is a form of dormancy, like hibernation, that ectotherms undergo to survive cold weather. Identifying the distribution of brumation sites is of particular conservation concern since this sedentary seasonal phase could make terrapins particularly vulnerable to coastal dredging activities that commonly occur during the winter months. We used acoustic telemetry to quantify the movement patterns of Northern Diamondback Terrapins in Wellfleet Harbor, Wellfleet, MA, and to identify brumation sites. In 2011–2012, we deployed an array of 21 fixed acoustic telemetry receivers throughout Wellfleet Harbor and its neighboring creeks, spanning an area of 4.3 km<sup>2</sup>. We then captured and fitted a total of 100 terrapins (69 females, 31 males) with external acoustic tags and monitored their movements until the tags turned off in December. Manual tracking was used late in the fall to locate brumation sites. Movement patterns varied widely among individuals, with no differences observed between sex or season (mean number of drainages occupied = 2.4, min = 1, max = 5). Cessation of movement also varied widely; most terrapins began brumating in early October, but several individuals remained active into December. Selection of brumation sites was distributed throughout Wellfleet Harbor, with tagged terrapins last detected in each of the primary tributaries. Individuals ( $n = 23$ ) monitored over multiple seasons exhibited a strong affinity for specific drainages and areas to brumate. A total of 37 brumating terrapins were located throughout Wellfleet Harbor, of which 22 individuals were found brumating in or near the proposed dredging area. The results from this study not only provide some of the first information on the spatial ecology of terrapins near the northern end of their range, but this information will also be used by federal, state, and local managers to determine any potential impacts to the terrapin population by proposed dredging.

Sun-PM1-D-3

## **Land Snail Assemblages in Relation to Calcium Availability in Northern Hardwood Forests**

**Cheryl A. Bondi** (SUNY ESF, Syracuse, NY; cabondi@syr.edu), **Colin M. Beier** (SUNY ESF, Syracuse, NY; cbeier@esf.edu), and **Kenneth Hotopp** (Appalachian Conservation Biology, Bethel, ME)

Terrestrial snails have important ecosystem functions and play a significant role in forest food webs. Land snails facilitate leaf-litter decomposition and nutrient cycling, and are a calcium-rich food source to higher-order consumers. Snails have a high calcium demand and their diversity and abundance is correlated with soil calcium (Ca). The biotic availability of Ca in the organic horizon may be a limiting factor in the distribution and abundance of some snail species. Decades of acidic deposition in the northeast has facilitated the loss of Ca from forest soils, while areas with highly buffered Ca-rich soils may support higher species richness and serve as refugia for Ca-dependent species. Given their abundance and ecological role, snail community health at the landscape-level may be important in maintaining ecosystem function. Our objective was to investigate relationships between snail abundance and species richness and soil chemistry, in the White and Green Mountains of New Hampshire and Vermont. In 2011, we conducted leaf-litter searches at 17 sites that represent a range of Ca availability for this region. We collected a total of 16,614 snails and identified them to the lowest taxonomic resolution possible. We found snail abundance increased along the gradient of soil Ca and pH at these sites. In addition, *Punctum minutissimum* (Small Spot)—an indicator of soil Ca availability—was highly abundant ( $>1000$  individuals/m<sup>2</sup>) at the sites in Vermont with the highest Ca levels. We also identify areas with high species richness and Ca-dependent species that may provide guidance for land management and conservation.

Mon-PM2-C-3

## **The Status and Distribution of the River Otter on Long Island, New York**

**Michael J. Bottini** (Long Island River Otter Project, East Hampton, NY; mike@peconic.org)

Field surveys were conducted and camera traps monitored between 2008–2012 to document the presence and distribution of *Lontra canadensis* (North American River Otter) on Long Island, NY, the largest island in the continental US. Unregulated hunting and trapping during the North American fur trade era (1500s–1850), as well as habitat changes, resulted in the extirpation of the River Otter over much of its historic range, including Long Island. Conservation laws and reintroduction programs have enabled this species to recover in many areas, including much of the mainland area of New York, New Jersey, and Connecticut that lies adjacent to Long Island. With its highly developed and urbanized western end situated closest to the mainland, Long Island poses a formidable challenge for terrestrial and semi-aquatic species, including the River Otter, to reestablish populations there. Field survey effort was directed by studying topographic and aerial maps to locate potential River Otter latrine sites, and by contacting Long Island wildlife agencies and environmental organizations for River Otter sighting and roadkill information. River Otter latrine sites, tracks, and roadkill sites were mapped, revealing a very uneven distribution of River Otters concentrated on the north shore of the island's western end. The results seem to indicate that River Otters are recolonizing Long Island by way of individuals dispersing from robust populations in Westchester and Connecticut, reaching the west end of the island at a point where the distance across Long Island Sound is less than or equal to the maximum recorded open-water crossing for this species (7.25 km). Camera traps have documented successful breeding, seasonal use of freshwater habitats, and overland routes used by River Otters to pass around dams where they are subject to collisions with motor vehicles. Three River Otters were killed in motor vehicle collisions during the 2011–2012 winter, and this source of mortality may be a serious impediment towards the recolonization of Long Island by River Otters. Much suitable habitat remains unoccupied on the island's east end and south shore. Otter-friendly ramps and modified fish passages are currently being designed to mitigate roadkill impacts.

Mon-PM1-C-1

## **Bee Communities in Gravel Pits in Western Massachusetts**

**Johanna E. Brophy** (University of Massachusetts, Amherst, MA; jebrophy@student.umass.edu) and **Joan C. Milam** (University of Massachusetts, Amherst, MA; jmilam@eco.umass.edu)

Recent evidence of declines in bee populations have resulted in increased interest in their ecology; however, many fundamental aspects of their natural history remain poorly understood. Since many species of native bees nest in sandy soil, we predicted they might select habitat based on substrate characteristics. To test this, we sampled bee diversity at 12 local gravel pits. I then analyzed the diversity of ground nesting bees at these sites with substrate samples from each of the pits to see if there was a correlation between the two. For bee diversity, we used data collected from May through October, 2012 from 12 different gravel pits in Franklin and Hampshire counties in western Massachusetts. Soil samples were collected using a systematic sampling technique and analyzed using standard USDA PSA methods. The substrate from each gravel pit was categorized as either sandy, sandy loam, or loamy sand using a USDA textural triangle. We captured nearly 3000 bees with over 115 species during the study. Analysis of these data will determine whether the nesting potential of these gravel pits is influenced by substrate characteristics, and help us better understand the role of gravel pits as important nesting habitat for bees.

Mon-PM2-A-5

## **Assessing the Impact of Prescribed Fire on Lepidopterans of the Ossipee Pine Barrens**

**Carly Brown** (University of Vermont, Burlington, VT; cbrown4@uvm.edu) and **Jennifer Pontius** (University of Vermont, Burlington, VT; Jennifer.Pontius@uvm.edu)

Pine barrens support highly specialized lepidopteran faunas that are adapted to the characteristic soil conditions, temperature regimes, and plant communities. I compared the diversity and abundance of rare moth species in areas managed with and without fire in the Ossipee Pine Barrens, Carroll County, NH. My goal was to assess the impact of prescribed fire on lepidopteran populations. Using black-light bucket-traps I collected 5846 moths representing 290 species, 9 of which are considered rare. The collections took place on 16 nights between May and September 2012 at 12 different locations in units burned 4- to-5 years prior to sampling (2 units) or that had not been burned for several decades (2 units). A chi-square goodness-of-fit test characterized species composition and population dynamics over the summer season in the burned and unburned units. Though these rare moths rely on pine barrens conditions that have traditionally been maintained by fire, preliminary results show a lesser abundance of some moth species in the units managed with fire. These results will influence the future management and monitoring of the lepidopterans of the Ossipee Pine Barrens.

Mon-AM1-D-1

## **Establishment of a Population of Blanding's Turtle (*Emydoidea blandingii*) at Assabet River National Wildlife Refuge: Headstarting and Translocation.**

**Brian O. Butler** (Oxbow Associates, Inc.; butler@oxbowassociates.com), Kurt A. Buhlmann (SREL), Stephanie L. Koch (USFWS), Tracey D. Tuberville (SREL), Brian A. Bastarache (Bristol County Agricultural HS), Veronica J. Palermo (OA), Jared Green (USFWS), Nicole Gerard (USFWS), and Lori Roy (OA)

The USFWS recently established a new national wildlife refuge (Assabet River NWR) on former military land in eastern Massachusetts. Despite abundant suitable habitat for Blanding's Turtles and two survey efforts separated by twenty years, Blanding's Turtle (listed as "threatened" in Massachusetts) was apparently absent from the 2000+ acre refuge. Using population data from another well documented site and population modeling projections, a program was initiated in 2007 to establish a new, self-sustaining Blanding's Turtle population in the ANWR. Through the efforts of diverse contributors, a program of nest protection, standardized head-starting, direct hatchling release, and translocation of subadults has been established without detriment to the donor population but with promising results after more than five years of translocation and monitoring.

Sun-AM1-B-3

## **Protecting Biodiversity through Regulation of Hydraulic Fracturing**

**Jennifer Caldwell** (University of Delaware, Wilmington, DE; jennycaldwell1@gmail.com) and **Christopher K. Williams** (Department of Entomology and Wildlife Ecology, University of Delaware, Wilmington, DE)

Hydraulic fracturing has the potential to negatively impact biodiversity through habitat changes including landscape fragmentation, erosion and sedimentation, noise and light pollution, and potential contamination from chemical components in fracturing fluid. While hydraulic fracturing has been exempted from some federal regulations in the United States, it is still subject to much regulation. This presentation reviews federal, state, and regional regulations applicable to hydraulic fracturing in the Marcellus Shale region of New York, Pennsylvania, Ohio, and West Virginia.

Sun-PM1-C-3

## **Numerical Response of the Endangered Karner Blue Butterfly (*Lycaeides melissa samuelis*) to Recovery Efforts at the Albany Pine Bush Preserve**

**Steven P. Campbell** (Albany Pine Bush Preserve Commission, Albany, NY; scampbell@albanypinebush.org), **Neil A. Gifford** (Albany Pine Bush Preserve Commission, Albany, NY; ngifford@albanypinebush.org), and **Amanda M. Dillon** (Albany Pine Bush Preserve Commission, Albany, NY; adillon@albanypinebush.org)

Pitch Pine–Scrub Oak barrens is a globally unique, fire-dependent ecosystem of the northeastern United States. The destruction, fragmentation, and degradation of this ecosystem has contributed to the decline of *Lycaeides melissa samuelis* (Karner Blue Butterfly), which is dependent on the barrens in the northeastern portion of its range. One of the last naturally occurring populations of this endangered species occurs at the Albany Pine Bush Preserve in eastern NY. State, private, and federal partners have been actively recovering the Preserve's Karner Blue Butterfly population by restoring >200 ha of Pitch Pine–Scrub Oak barrens since 1992 and by accelerating the colonization of newly restored areas through the annual release of 500–1700 locally derived, captive-reared animals since 2008. To evaluate the effectiveness of these efforts, we have been monitoring abundances of first and second brood adults annually since 2007 at 6–16 sites located throughout the Preserve. We sampled the sites 14–17 times each year using distance-sampling methodology and used the resulting data in a two-step process to estimate brood sizes for each year. First, we analyzed the data in Program Distance to estimate the combined abundance of all sites during each survey and then we used the survey-specific abundances in the Insect Count Analyzer (INCA) program to derive brood sizes. Preliminary results suggest that recovery efforts are succeeding. For all sites combined, the first brood increased from 900 adults in 2007 to 1800 adults in 2012, whereas the second brood increased from 600 to 3800 adults. These abundance estimates are likely conservative because occupancy surveys revealed that butterflies were present in many other parts of the Preserve that were not included in our distance-sampling effort. While it appears recovery efforts have increased the Karner Blue Butterfly abundance above the minimum federal recovery threshold for the Preserve in 2012, further monitoring is necessary to ensure that recovery is maintained and to document the effects of continuing recovery efforts and the influence of long-term processes such as climate change.

Sun-PM2-D-3

## **Temperature Sensitivity of the Demography and Distribution of Northern Tree Species**

**Charles D. Canham** (Cary Institute of Ecosystem Studies, Millbrook, NY; canhamc@caryinstitute.org)

Climate envelope models predict dramatic shifts in distributions of northern tree species under climate change, but those expectations typically ignore the actual dynamics of tree populations and communities. I will summarize the temperature sensitivity of demographic parameters related to reproduction, growth, and survival in northern tree species, based on analyses of forest inventory and analysis data. The results suggest that temperature sensitivity of fecundity and seedling survival will play a much larger role in forest response to climate change than will the temperature sensitivity of growth of either saplings or adult trees.

Sun-PM2-A-2

## **Recovery of an Alpine Plant Community Four Years After a Major Disturbance**

**Robert S. Capers** (George Safford Torrey Herbarium, Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs CT, robert.capers@uconn.edu) and **David W. Taylor** (Department of Biology, University of Portland, Portland, OR, taylorda@up.edu)

Four years after a disturbance in the alpine habitat on Mount Washington, we surveyed vascular plants, bryophytes, and lichens to determine how quickly the community is recovering. Plants had begun recolonizing in the disturbed area, but species richness and abundance remained far lower than in the undisturbed community. Bryophytes appear to be recovering somewhat more quickly than vascular plants. Among vascular plants, herbs, especially graminoids, have colonized most quickly, and woody species are largely absent. For vascular plants, treeline affects species richness, abundance, and the rate of recovery, but there is no evidence of an additional effect of elevation either above or below treeline. Treeline affects bryophytes and lichens as well, and there is an independent effect of elevation such that species richness declined with elevation in the disturbed community but not in the undisturbed community, suggesting a transient effect of elevation on colonization and/or survival, but only above treeline.

Mon-PM1-A-3

## **Beyond the Chalkboard: How Students Benefit from Cooperative Conservation**

**Aaron G. Caswell** (Bristol County Agricultural High School, Dighton, MA; acaswell@bcahs.com) and **Brian Bastarache** (Bristol County Agricultural High School, Dighton, MA; bbasterache@bcahs.com)

Cooperative conservation projects combine the knowledge and expertise of professionals in the field with a student's desire to learn and work and have a synergistic effect on both conservation and education. The addition of cooperative conservation projects to the Natural Resource Management Department of Bristol County Agricultural High School has allowed teachers to deliver the required curriculum in a way that is not only enjoyable to students, but has a positive impact on conservation efforts.

Mon-AM2-C-3

## **Spatial Scale and Expert Opinion in Modeling Pond-breeding Amphibian Habitat**

**Noah Charney** (Hampshire College, Amherst, MA; ndcNS@hampshire.edu)

When ecological models are used to guide conservation decisions, these models should be based upon substantial data and should be applied at appropriate spatial scales. Yet, ecologists are usually faced with scarce data and must often make subjective choices about scale. In this study, I examined a simple model and a complex model for assessing vernal pools based upon surrounding upland amphibian habitat. I optimized parameter values for spatial scale and landscape resistance using 896 ponds from 5 studies of Spotted Salamanders (*Ambystoma maculatum*) and Wood Frogs (*Lithobates sylvaticus*) in Massachusetts and Rhode Island. In predicting amphibian distributions, the complex model parameterized by an expert panel performed significantly worse than a null model with uninformative resistance values. The simple model performed the best. The best scale for measuring upland habitat in these models was in the range of 1000 m–3000 m, an order of magnitude larger than salamander migration scales previously proposed for wetland buffer zones. These results suggest that long-term conservation of these amphibians must rely on larger-scale management than what is possible through wetland buffer zones.

Sun-AM1-C-2

## **An Ant-Treehopper Mutualism Strengthens the Predatory Effects of Ants by Altering Ant Community Structure**

**Robert E Clark** (Wesleyan University, Middletown, CT; rclark@wesleyan.edu) and Michael S. Singer (Wesleyan University, Middletown, CT)

Ants play a crucial role in arthropod food webs as mutualists of sap-feeding herbivores and predators of foliage-feeding herbivores. As well studied as these interactions are, little is known about how ant and sap-feeder mutualisms may impact predation of foliage-feeders. We conducted a community-level ecological field experiment that examined ant predation and mutualism in oak-beech-maple forests in Middlesex County, CT. This study of multi-trophic interactions focused on ground-nesting ants, treehoppers (representing the sap-feeding guild) and caterpillars (representing the foliage-feeding guild). The effects of ant predation were observed by excluding ants from entire branches or saplings. Ants were manipulated in a full factorial design across eight tree species. Population density of each insect group was sampled exhaustively on each branch and sapling. Leaf area lost to foliage-feeding herbivores was measured at the end of the study. The results revealed that treehopper-ant interactions mediate the predatory effects of ants. The presence of ants resulted in lower caterpillar density and less leaf area lost to herbivores. However, this effect was only significant when treehoppers were present as well. Observation of the ant community revealed a novel mechanism by which the mutualism altered caterpillar predation. Treehoppers did not increase the local abundance of the numerically dominant ant species *Formica neogagates*. Instead, when treehoppers were present, the proportional abundance of *Camponotus* ants increased. This finding is notable because *Camponotus* ants are particularly effective predators of caterpillars. By altering ant community structure, ant-treehopper mutualisms strengthened the community-level effect of ant predation.

Mon-AM1-B-3

## **Activity Patterns of the Eastern Coyote in New York City**

**Suzanne M. Clemente** (Environmental Science Graduate Program, Pace University, NY; sc23198p@pace.edu) and Carolyn Koestner (Wildlife Technician Program, Mianus River Gorge, Bedford, NY; omarocks@live.com)

*Canis latrans* (Coyote) has expanded its geographical range and is now found throughout most of eastern North America and are well established in suburban and urban sections of Westchester County, NY. Most recently, they have been observed in numerous parks in New York City. Activity patterns reveal an important aspect of animal behavior. This research investigated whether the daily activity patterns of Coyotes differed with respect to diel interval, seasons, and level of urbanization using infrared camera traps. Cameras were placed in multiple parks in New York City metropolitan area from January 2012 to February 2013. We found that Coyotes tend to reduce their activity during the day, likely as a result of living in close proximity to the human population. Understanding the activity patterns of the Coyote in New York City could potentially lead to management strategies that would help reduce conflicts with humans.

Sun-AM2-C-5



## **Experimental Approaches to Understanding the Effects of Air Temperature on Incubation Behavior in a Cavity-nesting Bird**

**Ethan D. Clotfelter** (Amherst College, Amherst, MA; edclotfelter@amherst.edu) and Daniel R. Ardia (Franklin and Marshall College)

Environmental variation can have a dramatic impact on life-history decisions. Incubation behavior in birds is particularly sensitive to changes in temperature. Understanding this sensitivity is important as global climate change affects both seasonal average temperatures and within-season variability. We took an experimental approach to investigate the relationship between air temperature and incubation behavior in a population of cavity-nesting tree swallows, *Tachycineta bicolor*, in western Massachusetts. Experimental warming of nests increased incubation behavior, increased egg temperatures, and accelerated nestling growth. Experimental cooling of nests decreased incubation behavior, decreased egg temperatures, and resulted in nestlings of poorer quality. In some cases, these effects were exacerbated in the nests of lower-quality females. Our results show not only that air temperature affects incubation behavior in Tree Swallows, but that changes in temperature can produce long-lasting effects in the offspring.

Sun-AM1-D-3

## **Growth and Control of Flood-dispersed Japanese Knotweed (*Fallopia japonica*) in the Wake of Tropical Storm Irene**

**Brian Colleran** (VT Dept. of Fish & Wildlife, Essex Junction, VT; Brian.Colleran@state.vt.us) and Katie Goodall (University of Vermont, Burlington, VT; kegoodal@uvm.edu)

In response to the floods following tropical storm Irene, the state of Vermont hired a coordinator to develop and implement an early detection and rapid response (EDRR) work plan to eliminate as many newly distributed Japanese Knotweed plants as possible, using only manual labor. Removal work was carried out eleven to thirteen months after Irene, along four river systems in the state. During removal work, morphological data was collected from plants to develop EDRR recommendations. Our goal was to determine what aboveground shoots could tell us about the rest of the newly established plant, and develop management strategies based on the results. We found that the size of the emergent shoot is not related to the extent of underground growth, though it is related to the size of the propagule. We also found that 70% of new plants originated from rhizome fragments, and 30% were from stems. This proportion is similar to regeneration rates shown in laboratory studies conducted over much shorter time frames, suggesting that regenerative abilities are consistent over longer timeframes than previously documented. Our findings suggest that the best way to prevent the spread of Japanese Knotweed along rivers is to focus control efforts on those stands most susceptible to erosion. Additionally, our work provides evidence that by applying an EDRR framework to Japanese Knotweed control, the spread of this invasive plant can be effectively controlled without the use of herbicides or heavy machinery.

Mon-AM2-B-1

## **Citizen Scientist and Non-profit Environmental Organization Participation in Massachusetts Endangered Plant Conservation**

**Bryan A. Connolly** (Natural Heritage and Endangered Species Program, Division of Fisheries and Wildlife, West Boylston, MA ;[bryan.a.connolly@state.ma.us](mailto:bryan.a.connolly@state.ma.us)) and **William Brumback** (New England Wild Flower Society)

Massachusetts is fortunate to have a concentration of people and organizations that are concerned with endangered plant species conservation. Both individuals and non-profit organization are highly engaged and are taking active roles with recording census data, seed collection, and habitat management. Highlighted in this talk will be some of the accomplishments in conservation that has occurred in collaboration with Massachusetts Natural Heritage and Endangered Species Program (MNHESP), public citizens, and non-profit organizations. The New England Wild Flower Society (NEWFS) has played a prominent role in organizing and coordinating this effort in collaboration with the (MNHESP). The plant conservation volunteers (PCVs), citizen scientist volunteers trained by the NEWFS, are particularly noteworthy, and have been integral in plant conservation efforts in the state. In addition to the PCV program, NEWFS has published several information resources such as *Flora Novae Angliae*, *Flora Conservanda*, and the website GoBotany. These resources have raised plant conservation awareness and served as excellent reference material for identification of rare plants. Many other organizations will be discussed who have conducted high-impact conservation actions focused on rare plants. Trustees of Reservations, Nantucket Conservation Foundation, Sudbury Valley Trustees, Massachusetts Audubon, The Nature Conservancy, Martha Vineyard Land Bank, and many other groups are purchasing land, controlling invasive species, and conducting controlled burns to encourage the persistence and restoration of endangered plants in the Commonwealth of Massachusetts.

Mon-AM2-C-2

## **Adopt-a-Trout: Citizen-Science and Radiotelemetry**

**Peter Daniel** (Hofstra University, Hempstead, NY; [peter.c.daniel@hofstra.edu](mailto:peter.c.daniel@hofstra.edu))

Adopt-a-Trout builds upon Trout in the Classroom (TITC), a conservation-oriented environmental education program for K-12 students promoted by Trout Unlimited (TU), by extending student experience with the life cycle of the Brook Trout (*Salvelinus fontinalis*) from the classroom to the stream. On Long Island, students participating in TITC raise Brook Trout from eggs to fingerlings, and release them into streams and lakes, including Shu Swamp Preserve, Long Island, NY, part of the Oyster Bay Stewardship area and their only known spawning ground in western Long Island. Adopt-a-Trout allows students to participate in a radiotelemetry research project monitoring movements of newly released 1) young of the year (YOY) within the Preserve to determine microhabitat preferences and 2) mature Brook Trout (1+ year) to determine whether they migrate to brackish waters. Since the summer of 2012, we have been releasing radio-tagged and PIT-tagged YOY and mature trout provided by the Cold Spring Harbor Fish Hatchery. By Fall 2013 we will have tagged 30 YOY and over 200 mature trout. Movements of tagged fish are recorded by Hofstra University graduate students and faculty, school and local community groups, and TU volunteers. Stream characteristics are assessed using established survey procedures (Stream Visual Assessment Protocol) that are designed to be conducted by lay groups. All data is made available online at [www.adoptatrout.com](http://www.adoptatrout.com) in the form of spreadsheets and interactive maps (ArcGIS Online). A curriculum guide aimed for middle to high school audiences has been developed and is available at the site. The curriculum guide introduces students to the uses of telemetry and guides them in developing hypotheses about the movements of Brook Trout that they then test with the online data. We also maintain a blog at the site, providing daily updates of research and educational activities supplemented by photos and movies.

Mon-AM1-C-1

## **Acoustic Telemetry in New England Coastal Waters: Efficiencies and Limitations**

**Andy J. Danylchuk** (Department of Environmental Conservation, University of Massachusetts Amherst, MA; danylchuk@eco.umass.edu)

Advancements in acoustic telemetry have rapidly increased the use of this tool for understanding the spatial ecology of fish and other aquatic organisms. This form of biotelemetry can lead to important insights into habitat use, life histories, intra and interspecific interactions, and the impacts of natural and anthropogenic disturbances. Nevertheless, not recognizing the potential bottlenecks and limitations related to the use of acoustic telemetry, such as tag choice, experimental design, and data management, may lead to false expectations about what questions can adequately be addressed. Not appreciating the limitations and assumptions related to the use of acoustic telemetry can also potentially lead to erroneous conclusions about the spatial ecology of the aquatic organisms being tracked. Using examples and personal insights, my talk will shed light on some of the pros and cons of using acoustic telemetry to quantify the spatial ecology of aquatic organisms in New England coastal waters.

Sun-PM1-D-1

## **Breeding Ecology of a Montane Songbird along an Elevation Gradient: Consequences of Temporal and Spatial Variation in Climate**

**William V. DeLuca** (University of Massachusetts, Amherst, MA; wdeluca@eco.umass.edu), **David I. King** (Northern Research Station, USFS, Amherst, MA; daveking@eco.umass.edu), **Kent P. McFarland** (Vermont Center for Ecostudies, Norwich, VT; kmcfarland@vtecostudies.org), and **Christopher C. Rimmer** (Vermont Center for Ecostudies, Norwich, VT; crimmer@vtecostudies.org)

Climate is an important determinant of bird distribution, habitat quality, and reproductive success. In light of a changing climate, several studies have examined the effect of temporal variation of climate on the timing of breeding and species' distribution. However, the spatial variation of climate in the compressed climatic zones within a habitat type that exists along the elevation gradient in montane forests provides a novel opportunity to examine the role of climate in determining habitat quality for birds. The objectives of this study were to examine how temporal and spatial variation in climate affects the reproductive ecology of a montane forest, neotropical migratory songbird, Blackpoll Warbler (*Setophaga striata*). We collected 15 years (1994–2008) of nesting data from the Green Mountain National Forest to determine whether annual variation in climate lead to changes in the onset of Blackpoll nest initiation. We also collected reproductive and demographic data for Blackpolls in the White Mountains, NH between 2007 and 2009 across an elevation gradient. We found that temporal climate variation was an important factor for determining Blackpoll nest initiation. We also found substantial evidence to suggest that spatial variation in climate, with increasing elevation, drives a gradient of habitat quality for montane birds. Abundance, nest survival, fecundity, pairing success, and age increased with increasing elevation. Because our elevation gradient represents a gradient of climactic conditions predicted for northeastern North America under various climate-change scenarios, our findings provide important insight to the response of high-elevation bird communities to a changing climate.

Mon-AM1-A-4

## The Response of Species to Projected Climate and Landscape Changes Inform the Design of Sustainable Landscapes

**William V. DeLuca** (University of Massachusetts, Amherst, MA; [wdeluca@eco.umass.edu](mailto:wdeluca@eco.umass.edu)), Kevin McGarigal (University of Massachusetts, Amherst, MA; [megarigalk@eco.umass.edu](mailto:megarigalk@eco.umass.edu)), Brad Compton (University of Massachusetts, Amherst, MA; [bcompton@eco.umass.edu](mailto:bcompton@eco.umass.edu)), Joanna Grand (University of Massachusetts, Amherst, MA; [jgrand@metacomet.com](mailto:jgrand@metacomet.com)), Ethan Plunkett (University of Massachusetts, Amherst, MA; [ethan@plunkettworks.com](mailto:ethan@plunkettworks.com)), and Lisabeth Willey (University of Massachusetts, Amherst, MA; [lwilley@cns.umass.edu](mailto:lwilley@cns.umass.edu))

The primary goals of conservation are to protect, manage, and restore habitat, minimize the forces of habitat degradation, and design landscapes to ensure habitat connectivity and persistence within the limits imposed by the socio-economic realities of human population growth. To achieve these objectives, we developed a landscape change, assessment, and design model for the North Atlantic Landscape Conservation Cooperative that enabled us to predict changes to species' distributions under a variety of alternative future climate-change and urban-growth scenarios. We downscaled general circulation models to predict changes in climate and constructed a regional urban-growth model. We then developed habitat-capability models and climate-niche-envelope models for a suite of representative bird species to assess the effects of predicted landscape and climate-change scenarios in three pilot watersheds. We assessed the nature and magnitude of potential habitat gains and losses due to projected changes in climate and urban growth by identifying areas on the landscape where species' distributions are most likely to persist, contract, or expand. We describe the implications for strategic habitat conservation planning given uncertainty in future climate and landscape conditions and develop tools to inform landscape design that effectively combines approaches that simultaneously address habitat loss and potential shifts in species' climate-niche envelopes.

Mon-PM2-D-1

## Wildlife Camera Trapping in the Albany Pine Bush Preserve

**Amanda Dillon** (Albany Pine Bush Preserve, Albany, NY; [adillon@albanypinebush.org](mailto:adillon@albanypinebush.org)), Paul Gallery (Albany Pine Bush Preserve, Albany, NY), and Neil Gifford (Albany Pine Bush Preserve, Albany, NY; [ngifford@albanypinebush.org](mailto:ngifford@albanypinebush.org))

The Albany Pine Bush Preserve is a fire-dependent, inland pine barrens ecosystem. Although still one of the best remaining examples of this globally rare ecosystem, the preserve has become degraded after years of fire suppression. Restoration of the preserve is occurring through mowing, herbicide application, selective thinning and prescribed burning; this management will improve the habitats necessary for the endemic plants and animals. Large mammals represent an important component of the animal community at the preserve yet are not well documented beyond anecdotal observations. To gather data about the large-mammal community composition and its response to management, we have been using Reconyx HC600 wildlife cameras in restored and actively managed areas of the preserve. Starting in March 2012, cameras were deployed for two-week periods in randomly selected 30-m x 30-m plots, and to date we have collected data in 76 plots in two areas of the preserve. The cameras captured over 20,000 images of 13 different species. *Odocoileus virginianus* (White-tailed Deer) were by far the most frequently captured on camera, comprising 79% of the total animal detections, followed by *Urocyon cinereoargenteus* (Gray Fox; 9%), *Silvilagus floridanus/transitionalis* (Eastern/New England Cottontail; 5%) and *Sciurus carolinensis* (Eastern Gray Squirrel; 5%). Other captured species, including *Martes pennanti* (Fisher), *Mephitis mephitis* (Striped Skunk) and *Canis latrans* (Coyote), collectively comprised <3% of the detections. Thus far, White-tailed Deer were the only mammals to be observed immediately following a management event. In the upcoming months, we will strengthen our study by expanding our sampling effort to include collecting baseline data on the large-mammal community of areas prior to restoration (e.g., *Robinia pseudoacacia* [Black Locust] forest).

Mon-AM2-D-1

## Effects of a Floral Resource Pulse on Pollen Use by *Bombus impatiens*

**Dash H. Donnelly** (Harvard Forest, Petersham, MA; [dash.donnelly@gmail.com](mailto:dash.donnelly@gmail.com)) and Elizabeth Crone (Harvard Forest, Petersham, MA; [ecrone@fas.harvard.edu](mailto:ecrone@fas.harvard.edu))

Food resources for Bumble Bees vary in space and time. Bees use pollen as a primary source of protein that is necessary for larval growth and egg production. Increases in resources have been shown to increase body and colony size, but we don't know how resource availability affects what food sources bees are using. We tested the effects of increased resources using pollen-load analysis of bees in six *Bombus impatiens* colonies. Three colonies were given access to patches of flowering *Phacelia*, as well as the ability to forage in the wild (hereafter "pulse" colonies). Three control colonies were given no supplemental resources. Each week, bees were marked and measured while also taking a pollen-load sample. In the lab, we analyzed the contents of each bee load with light microscopy to determine the number of different species as well as the number of pollen grains present. To aid this analysis, we developed a pollen library containing all of the plant species present at Harvard Forest. Not surprisingly, bees used *Phacelia* more in pulse cages, but there was no difference in the species richness of pollen from other species. Pulse colonies produced smaller bees, in contrast to past studies, while still producing more workers than control colonies, which is consistent with past studies. Analyses of species diversity of pollen from bees in both treatments are in progress.

Mon-PM2-A-4

## Reinterpreting *Amelanchier arborea* (Rosaceae)

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*Amelanchier arborea* (Michx. f.) Fern. as currently circumscribed is wide-ranging in eastern North America, both as diploids and tetraploids. The diploid is a member of what we refer to as the arborescent clade, with *A. laevis* Wieg. and *A. canadensis* (L.) Medik., that is strongly supported by DNA sequence data. Members of this clade have many-flowered, elongate inflorescences, normally glabrous ovary summits, and (at least in most *A. arborea* individuals) an arborescent habit. Diploid *A. arborea* is morphologically diagnosable by the character suite of strongly recurved sepals, acuminate leaf apices, and sparsely to moderately hairy mature leaf blades. Our fieldwork has identified numerous tetraploid individuals that conform to this general morphology. However, our data show that many named entities historically allied with *A. arborea* are of hybrid origin. Morphology and data from the second intron of the LEAFY gene, for example, show that *A. sera* Ashe is a hybrid between *A. arborea* and *A. canadensis*. Similarly, a taxon from central Maine that we refer to as *A. "oligoflora"* contains *A. arborea* and *A. humilis* Weig. genomes. Morphological and limited molecular evidence indicate that *A. alabamensis* Britton nests with *A. arborea* from Georgia. Hairy ovary summits and extremely narrow petals, which diagnose *A. alabamensis*, can be found sporadically throughout the range of *A. arborea*. In phylogenetic trees based on nuclear regions ETS and ITS, as well as the LEAFY gene, some tetraploid *A. arborea* individuals are linked to diploid *A. arborea* and/or *A. laevis*, *A. humilis*, and *A. canadensis*. These trees suggest that tetraploid *A. arborea* is an assemblage of genetically heterogeneous allotetraploids of multiple origins, with some originations incorporating genetic material from outside the arborescent clade. Morphologically, *A. arborea* is closest to *A. laevis*, and we have collected cryptic hybrids between them.

Mon-PM2-B-3

## Twenty-five Year Impacts of Season and Frequency of Burning on Pitch Pine/Oak Forests: An Experimental Approach

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The objectives of this long-term study included evaluating the effects of season and frequency of prescribed fire and cutting treatments on plant species composition, fuel loads, and fire behavior in Pitch Pine/oak woodlands at Cape Cod National Seashore (Truro, MA). Since 1986, we have burned ( $n = 24$ ) or brush cut ( $n = 24$ ) forty-eight 0.16-ha plots. Five additional plots were left untreated. Treatments were applied in the dormant and growing season at 1-, 2-, 3-, and 4-year intervals, with three replicates each of 16 treatment combinations. Here, we describe the overall study and report treatment effects on trees for 1986–2007. Stem mortality was significantly affected by treatment type but not by season or interval of treatment. By 1991, burn plots had significantly lower stem densities than mow or control plots ( $P < 0.001$ ) due to high stem mortality. After 1991, stem mortality was similar among treatments. After 22 years, density on burn plots had declined significantly ( $P < 0.0001$ ,  $n = 53$ ) relative to plots not burned. Little in-growth occurred on any of the 53 plots. In unburned plots, *Quercus velutina* (Black Oak) and *Q. alba* (White Oak) combined experienced  $\approx 30\%$  mortality over 22 years; *Pinus rigida* (Pitch Pine) experienced only 10% mortality. Pitch Pine also had relatively low mortality in burn plots compared to Black and White Oak, which combined had 52% mortality over 22 years. Initial stem size (dbh) had a significant effect on tree survival ( $P < 0.0001$ ,  $n = 2210$ ), with smaller stems experiencing higher rates of mortality. Stems  $>25$  cm dbh in 1986 experienced almost no mortality from 1986–2007 in any of 53 plots. Overall, Pitch Pine mortality was lower than for oaks. Most pines were  $>15$  cm dbh. Oaks had higher densities of stems  $<15$  cm dbh, with few stems  $>25$  cm dbh. When species effects were examined across the size range in which all species were common (10–25 cm dbh), there was no significant species effect on stem survival ( $P = 0.17$ ,  $n = 1546$ ). Most stems of all species  $<7$ –10 cm dbh were scarred by initial burns and subsequently died. Many larger oaks scarred in initial burns eventually toppled due to additional scarring and basal rot.

Mon-AM1-D-2

## **Environmental Conditions of Wetlands Hosting the Endangered Butterfly *Lycaena dorcas claytoni***

**Sarah Drahovzal** (Department of Wildlife Ecology, University of Maine, Orono, ME; Sarah.Drahovzal@umit.maine.edu), **Cynthia Loftin** (US Geological Survey, Maine Cooperative Fish and Wildlife Research Unit, Orono, ME; cynthia.loftin@maine.edu), and **Judith Rhymer** (Department of Wildlife Ecology, University of Maine, Orono, ME; judith.rhymer@umit.maine.edu)

Maine's circumneutral wetlands contain Shrubby Cinquefoil (*Dasiphora fruticosa*), the sole host plant for the state-endangered Clayton's Copper butterfly (*Lycaena dorcas claytoni*). Environmental conditions of these wetlands are not well-defined. Wetland hydrological and chemical conditions may affect the distribution and robustness of *D. fruticosa*, potentially affecting its use as a host plant by *L. d. claytoni*. We evaluated pore water nutrients, vertical flow and water table fluctuations, shrub and tree species composition and distribution, and *D. fruticosa* distribution, structure, age, and condition in ten wetlands; seven of these sites support populations of *L. d. claytoni*. We identified five hydrological types based on differences in water source and surface- and groundwater dynamics. Three wetlands were dominated by groundwater discharge, six wetlands were down-flow dominant, and one site fluctuated between groundwater discharge and recharge. Pore water analytes reflected hydrogen ion and conductivity gradients among the wetlands and vegetation community distributions within the wetlands; however, these differences did not reflect presence of *L. d. claytoni*. *Dasiphora fruticosa* age ranged from 7 to 37 years. *Lycaena dorcas claytoni* encounter rates were greater in sites containing larger *D. fruticosa* plants of intermediate age and with greater bloom density. Butterflies are able to differentiate between glucose, fructose, and sucrose in nectar, and many studies have demonstrated a preference of sucrose over hexose. We found *D. fruticosa* produces hexose-dominant nectar (sucrose/[glucose + fructose] < 0.1), with only trace amounts of sucrose measured in <3% of the samples. Conservation and recovery of *L. d. claytoni* depends in part on the quality and distribution of its habitat. Our research will inform habitat management recommendations for *D. fruticosa* and potentially identify unoccupied sites that may be suitable for *L. d. claytoni*.

Mon-PM1-C-3

## **Population Dynamics of Hemlock Woolly Adelgid**

**Joseph Elkinton** (Department of Entomology, University of Massachusetts at Amherst, Amherst, MA; elkinton@ent.umass.edu) and **Elizabeth Sussky**

We recorded survival and fecundity across the two annual generations of Hemlock Woolly Adelgid in both natural and experimentally created populations. We show that adelgid mortality in the summer generation plays a very large role in explaining the observed densities of adelgid and why adelgid populations persist for many years without killing hemlocks in the northeastern United States.

Sun-AM2-A-1

## **Identification and Distribution of Early Detection Invasive Species in the Connecticut River Watershed**

**Ted Elliman** (New England Wild Flower Society, Framingham, MA; telliman@newfs.org)

Building on the introduction offered by Cynthia Boettner and the vital need for a cooperative early detection effort, this presentation will introduce twenty plant species that are just beginning to appear in the Connecticut River watershed or its environs. Karen Lombard and Brent Kinal outlined the two online databases currently in use; those databases are the repositories for good field reporting and observations; they are also the basis for coordinated planning and treatment implementation. But it all begins with proper identification, and the key to recognizing plants species in natural settings is the training of land stewards, students, interest groups, and concerned citizens. Many of these species that I will present are still unusual and unfamiliar in the watershed area; they may in fact remain somewhat in check until conditions favor a burst of growth, an explosion and rapid expansion of the population. They will be serious ecological threats if that threshold is crossed, and the cost of containing or eradicating the populations will be enormous. This presentation will compare the physical features of these early detection invasives with those of look-alike native species. Often the two will favor similar habitats and are easily mistaken, one for the other. Equipped with this base level of knowledge, participants today will improve their invasive-species identification skills and better serve the region-wide cooperative effort. The ecosystems in the Connecticut River watershed are special and unique, worthy of active management, and an ever-expanding circle of committed stewards is the key to long-term resilience.

Sun-PM1-B-4

## **The Ants of Rhode Island: Historical Records and New Observations**

**Aaron M. Ellison** (Harvard Forest, Petersham, MA, aellison@fas.harvard.edu) and Elizabeth J. Farnsworth (New England Wild Flower Society, Framingham, MA, efarnswo@mtholyoke.edu)

Less is known about the ant fauna of Rhode Island (RI) than of the other five New England states. Of 28,205 historical specimen records and 132 species recorded from New England (1861–2011), only 208 (0.7%) specimens representing 47 species were from RI. The extrapolated (Chao1 estimator) total ant species richness ( $S$ ) for all of RI from these historical data = 51 (95% confidence interval = 48–66 species). As of December 2011, over 90% of all RI specimens, and all but seven of RI's species, had been collected in Washington County in the southwest part of the state. Statistical relationships between species richness and county-level geographic and climatic variables across New England predicted that the number of ant species in RI counties other than Washington County should be at least 3-fold higher, but that fewer than 10 ant species in Washington County remained uncollected. In 2012, we intensively sampled ants on Block Island (Washington County) and at Tiverton's Fort Barton Woods (Newport County). Our goals were to increase the specimen records for RI, especially in uncollected localities, and to determine the reliability of statewide extrapolation and county-level regression models. Three days of collecting yielded 181 new specimen (nest) records representing 31 species, 8 of which were new state records. The new species count for RI (55) is within the confidence bounds of the statewide  $S$  predicted from historical data; including these new data revises the prediction upward to 60 species (95% c.i. = 56–76 species) present in RI. Six species collected on Block Island were new records for Washington County, increasing that county's  $S$  from 44 to 50. Twenty-two species collected at Tiverton were new records for Newport County, increasing that county's  $S$  from 2 to 24, suggesting that the county-level regression model for  $S$  is reliable. Among the new county records, 5 of the Block Island species and 6 of the Tiverton species were new state records. Targeted searching and collecting in RI's under-sampled towns, counties, and unique habitats (e.g., pine barrens, sand plains, and wetlands) would provide additional new information on its potentially rich ant fauna.

Sun-AM1-A-3



## Forecasting Species Distributions: Lessons from Ants

**Aaron M. Ellison** (Harvard Forest, Petersham, MA; aellison@fas.harvard.edu), **Nicholas J. Gotelli** (University of Vermont, Burlington, VT; ngotelli@uvm.edu), and **Matthew C. Fitzpatrick** (Appalachian Lab, University of Maryland Center for Environmental Science, Frostburg, MD; mfitzpatrick@umces.edu)

MaxEnt ("maximum entropy") is one of the most widely used tools in ecology, biogeography, and evolution for modeling and mapping species distributions using presence-only occurrence records and associated environmental covariates. Despite its popularity, the exponential model implemented by MaxEnt does not directly estimate occurrence probability, the natural quantity of interest when modeling species distributions. Instead, MaxEnt generates an index of relative habitat suitability. MaxLike, a newly introduced maximum-likelihood technique, directly estimates the probability of occurrence using presence-only data. However, the performance and relative merits of MaxEnt and MaxLike remain largely untested, especially when modeling species with relatively few occurrence data that encompass only a portion of the geographic range of the species. Using geo-referenced occurrence records for six species of ants in New England, we compare MaxEnt and MaxLike. By most quantitative metrics, the performance of MaxLike equals or exceeds that of MaxEnt. More importantly, the relative suitability index estimated by MaxEnt neither represents the probability of species occurrence nor is correlated with it. For species distribution modeling, MaxLike, and similar models that are based on an explicit sampling process and that directly estimate probability of occurrence should be considered as important alternatives to the widely used MaxEnt framework.

Mon-AM1-B-4

## Bats of Long Island, New York

**Michael S. Fishman** (Barton and Loguidice, P.C., Syracuse, NY; mfishman@bartonandloguidice.com)

Long Island, NY is a glacial moraine and outwash plain that is a geologically and ecologically unique region of New York, and contains habitats and conditions not widely studied in bat ecology. Discovery of a Northern Bat (*Myotis septentrionalis*) showing signs of White-nose Syndrome (WNS) on Long Island in 2011 spurred interest in learning more about the current species distribution of bats on Long Island in order to document anticipated changes due to WNS, and to see if relative frequency changes had occurred since the first major survey of bats occurred on Long Island 100 years ago. We conducted mist net and acoustic surveys at 28 net sets divided between Brookhaven National Laboratory (BNL) in Upton, Suffolk County, NY ( $n = 12$  sites) and Wertheim National Wildlife Refuge in Brookhaven, Suffolk County, NY ( $n = 16$  sites). We captured 125 bats of 3 species: *Eptesicus fuscus* (Big Brown Bat), *Lasiurus borealis* (Eastern Red Bat) and *Myotis septentrionalis* (Northern Bat). We acoustically detected these species, as well as *Myotis lucifugus* (Little Brown Bat), *Myotis leibii* (Eastern Small-Footed Bat), *Lasiurus cinereus* (Hoary Bat), and *Lasionycteris noctivagans* (Silver Haired Bat). Relative frequency distribution of captures was similar to those observed on other sites 1 year after detection of WNS, suggesting that WNS may have been delayed in reaching Long Island. Habitat use comparisons were also made between a burned and unburned section of pine barrens habitats at BNL. *Lasiurus borealis* preferred unburned pine barrens, while *Myotis septentrionalis* preferred burned patches. *Eptesicus fuscus* did not exhibit a selection of either habitat condition.

Mon-PM2-C-4

## **Chemical and Biological Control of *Ailanthus altissima***

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

This is the third and final presentation on *Ailanthus altissima* (Tree-of-Heaven). It will show that *Ailanthus altissima* is easy to kill by chemical methods 24/7/365. At the same time, over several states and years, a naturally occurring biocontrol system has been observed that is effectively killing *Ailanthus altissima*. This system serves as a model for finding biocontrol systems for other invasive non-native organisms and ending the scientifically unsound practice of introducing yet more non-native organisms to control current and future problems.

Mon-AM2-B-3

## **Locating and Using Native Biocontrols for Invasive Non-native Plants, a New Paradigm**

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

The debate over using classical biocontrol to control invasive non-native organisms is redundant and stale. Instead of searching for new methods and synergies, the debate is over the pros and cons of classical biocontrol. This presentation will offer examples of native biocontrol systems. At the same time, it will offer practical insights into finding native biocontrols for non-native invasive plants. The goal of this presentation is to help end the continuing unethical and scientifically flawed introduction and use of non-native organisms in hopes of controlling other non-native organisms.

Sun-PM2-B-3

## **Monitoring Wildlife Using Smartphones: The Role of Mobile Devices in Research and the Classroom**

**Danielle Garneau** (SUNY Plattsburgh, Plattsburgh, NY; dgarn001@plattsburgh.edu), Erin Bradshaw Settevendemio (University of Florida, Gainesville, FL, erinlbradshaw@gmail.com), Kevyn Juneau (Michigan Technological University, Houghton, MI, kjjuneau@mtu.edu), Kate Podwirny (SUNY Canton, Canton, NY, katpod3@gmail.com), and Adventurers and Scientists for Conservation (Bozeman, MT, info@adventureandscience.org)

Numerous on-going citizen science projects are mobilizing the public to collect data at a large-scale, well beyond the scope of that of a typical researcher. In June 2012, I developed two smartphone apps to collect data on wildlife sightings, both dead and alive, to be used in research and pedagogy. Using the open-source Epicollect platform and smartphone app, RoadkillGarneau and WildlifeBlitzGarneau projects were developed. TrackingWildlifeSignGarneau was recently launched to aid wildlife trackers and conservation biologists who are systematically monitoring transects and wildlife corridors in the region. As of February 2013, RoadkillGarneau has citizen scientists collecting across the United States in 12 states (CO, FL, MA, MI, NC, NY, NH, NM, PA, OK, TX, and VT), having logged 39 species with 248 representative individuals. Similarly, WildlifeBlitzGarneau has participants collecting in 8 states (AK, FL, MA, MT, NC, NY, SC, and TX) and Quebec, Canada, having logged 81 species with 152 representative individuals. Smartphone technology streamlines data collection, facilitates the process of georeferencing, photo-documenting, and data organization, and encourages participation in research projects. In the Epicollect platform, data can be sent to an open-source Google AppEngine, making real-time data available on a webpage for participants to experience their scientific impact instantaneously. Adventure enthusiasts have created projects in iNaturalist (ASC Wildlife Observations, ASC Wildlife Track Project) to serve as a comparison to the Epicollect platform. For those without smartphones, embedding a google form and map into a webpage has been a successful alternative to grow participation among citizens. This project has the potential to engage audiences ranging from naturalists, to those who drive as part of their job, Department of Transportation affiliates, as well as techies.

Mon-AM1-C-2

## **Evolution of Increased Biomass Does Not Result in Increased Competitive Ability during Invasion**

**Zoe Getman-Pickering** (Hampshire College, Amherst, MA; zlg09@hampshire.edu), Casey terHorst (Kellogg Biological Station; terhors3@msu.edu), and Jennifer Lau (Kellogg Biological Station; jenlau@msu.edu)

Species that invade novel habitats experience unique selection pressures and their traits may rapidly evolve to adapt to their new environment. When these species experience release from their natural enemies, they may have increased resources available to invest in competitive ability. The Evolution of Increased Competitive Ability hypothesis predicts such trait evolution may explain invasion success of some species. We measured evolutionary changes in invasive *Medicago polymorpha* (Burclover) by comparing traits in genotypes from the native and introduced ranges. Specifically, we asked: (1) Are morphological traits, such as height and biomass, different between genotypes from the native and introduced range? (2) If we find evidence of evolutionary change, does this influence the competitive effect or response of these genotypes? We grew 15 native-range *M. polymorpha* genotypes and 19 invasive-range *M. polymorpha* genotypes in the greenhouse with each of three herbaceous co-occurring competitors. We found that the invasive *M. polymorpha* genotypes significantly ( $P = 0.047$ ) heavier by 17.4% and almost 30% taller than genotypes from the native range, suggesting evolutionary changes in size occurred during or after the invasion process. However, invasive- and native-range genotypes had remarkably similar competitive effects on all three competitors, and they had similar responses to competition from these species. These results suggest that although contemporary evolution in the invasive range resulted in increased *M. polymorpha* size, this had no effect on their competitive ability. If evolution affects invasion success it is through means other than direct interactions. With this in mind, further tests are needed to explore not only evolution, but also how it affects interactions with other species.

Mon-PM1-B-4

## **Simulated Thinning of Pine Barrens Forest and Crown Fire Hazard at the Wildland-Urban Interface.**

**Neil A. Gifford** (Albany Pine Bush Preserve Commission, Albany, NY; ngifford@albanypinebush.org) and Jason T. Bried (Oklahoma State University, Oklahoma City, OK, bried@okstate.edu)

Pine barrens contain some of the most volatile wildland fuels in North America's sub-boreal forest region. In many of the region's pine barrens, human disturbance has led to artificially high densities of *Pinus rigida* (Pitch Pine), generating concern about the potential ignition and spread of catastrophic crown fire. Consequently, understanding the risks of crown fire and how best to reduce crown fire hazard is important for pine barrens in urbanized landscapes. At the Albany Pine Bush Preserve, NY, we used Pitch Pine canopy fuel characteristics from six stands to model crown fire hazard reduction under various simulated harvest scenarios to develop guidance for thinning operations. We used previously derived allometric equations to estimate canopy fuel properties from Pitch Pine diameter, height, and crown dominance. Fuel, weather, and topographic characteristics were used for predicting fire type along with crown fire initiation and propagation. In several cases, simulations predicted that potentially catastrophic crown fires are possible if wildland fire reaches the canopy in these stands. Harvest simulations prescribed up to 70% reduction in stand density and basal area and called for a residual density of 70–120 trees per hectare to reduce the likelihood of catastrophic fire. In addition to reducing crown fire risk, thinning overstocked Pitch Pine stands can also promote the conservation of a wide variety of flora and fauna characteristic of the region's pine barrens ecosystems.

Mon-AM2-D-2

## Drivers of Long-term Dynamics of Lowland Boreal Birds in the Adirondack Park, NY

**Michale Glennon** (Wildlife Conservation Society, Saranac Lake, NY; [mglennon@wcs.org](mailto:mglennon@wcs.org))

New York State's Adirondack Park is a large, intact breeding ground for numerous migratory bird species, several of which are declining throughout their range. A unique component of the Adirondack avifauna is the birds inhabiting the boreal peatlands of the Park. Climate change is now widely recognized as the pre-eminent threat to biodiversity in the 21<sup>st</sup> Century. At the southern range extent for this ecosystem type and many of its avian inhabitants, the Park is a valuable location from which to monitor changes in bird populations from a warming climate. The Wildlife Conservation Society (WCS) has been studying the distribution and abundance of birds in lowland boreal habitats of the Adirondacks, and our work offers the first comprehensive assessment of the status and trends in occupancy for a suite of boreal target species. Among the migratory species on our target list, the Lincoln's Sparrow (*Melospiza lincolnii*), Yellow-bellied Flycatcher (*Empidonax flaviventris*), Palm Warbler (*Setophaga palmarum*), and Olive-sided Flycatcher (*Contopus cooperi*) have the highest predicted rates of occupancy, while Rusty Blackbird (*Euphagus carolinus*) and the Cape May (*Setophaga tigrina*), Tennessee (*Oreothlypis peregrina*), and Bay-breasted (*Setophaga castanea*) Warblers appear to have much lower occupancy rates in the Park. Among migrants, only Lincoln's Sparrow and Palm Warbler demonstrated a pattern of increasing occupancy from 2007–2011, while the Rusty Blackbird and Yellow-bellied and Olive-sided Flycatchers demonstrated patterns of decline. These declining trends are cause for concern for species already rare in the region, and made more troubling by observed declines in occupancy of other nonmigratory species in the same habitats (i.e., Black-backed Woodpecker [*Picoides arcticus*], Boreal Chickadee [*Poecile hudsonicus*], Gray Jay [*Perisoreus canadensis*]). Analysis of the influence of wetland size, connectivity, latitude, elevation, and proximity of human infrastructure indicated that wetland size and context were most important in determining patterns of boreal bird occupancy, but that dynamics of birds in these habitats are influenced strongly by latitude and human impact. This finding suggests that bird responses to climate change may be mediated by urbanization, highlights the importance of metapopulation dynamics, and raises important implications for potential conservation strategies in these habitats.

Mon-PM2-C-2

## **Hymenopteran Diversity and Behavioral Composition on an Island Sandplain: Bees of Martha's Vineyard, Dukes County, MA (Hymenoptera: Apoidea: Anthophila)**

**Paul Z. Goldstein** (University of Maryland, College Park, MD and Smithsonian Institution, Washington, DC; goldsteinp@si.edu, drpzgoldstein@gmail.com) and John S. Ascher (American Museum of Natural History, New York, NY; ascher@amnh.org)

Massachusetts' offshore islands have received considerable entomological attention and currently support the highest concentrations of threatened species in the Commonwealth. In light of growing concern for regional pollinator diversity and the island's status as a refugium for insects declining on or extirpated from mainland New England, we report the results of an intensive inventory of Martha's Vineyard bees comprising two years' efforts netting and over 300 trap lines in each of the island's six towns. We document 180 species in 31 genera comprising over 14,000 databased specimen records. Findings include several regional rarities and habitat obligates of sandplains, previously undocumented host associations for bee cleptoparasites, and at least one undescribed species, as well as the apparent demise of at least two species of bumble bee, *Bombus* (*Bombus*) *affinis* and *B. (B.) terricola*, paralleling mainland declines. The Vineyard's bee fauna is dominated by soil nesters and solitary bees, but parasitic bees comprise an impressive 24% of the documented fauna, and the assemblage of flower specialists is diverse relative to both smaller offshore islands in the region and adjacent mainland counties. Distributions of parasitic, social, and solitary bees, and overlap between sampling years and among sites are consistent with the suggestion that resource-limited species—which exist in low numbers and are vulnerable for biological reasons in addition to simple rarity—are less readily sampled than generalist social bees with more protracted flight seasons. To the extent sampling methods are biased against parasitic or oligolectic bees, those species potentially most relevant to detecting and identifying pollinator decline are least likely to be captured. We remark on the feasibility of proposals to translate infrequent large-scale sampling efforts into assays of faunal change or endangerment.

Mon-PM2-A-1

## **Habitat Associations of Threatened Lepidoptera on Martha's Vineyard (Dukes County, MA): Historical and Empirical Insights from an Island Sandplain**

**Paul Z. Goldstein** (University of Maryland, College Park, MD and US National Museum, Washington, DC; goldsteinp@si.edu) and **Tim Simmons** (Massachusetts Natural Heritage and Endangered Species Program, Westborough, MA; tim.simmons@state.ma.us)

Martha's Vineyard, the largest of southern New England's offshore islands, supports one of the highest concentrations of threatened Lepidoptera in the northeastern United States. We explore the association of threatened moth assemblages with such habitats against a background of regional decline, and emphasize the relevance of moth life-history requirements to understanding their distributions in inland, coastal, and island sandplains. Based on more than 25 years of targeted lepidopteran sampling across the island and nearly a century of recorded collecting, we summarize and interpret biogeographically and ecologically significant records of relevance to ongoing regional conservation programs. Historically, these included 32 of 46 state-listed Lepidoptera species in Massachusetts, of which 27 are extant on Martha's Vineyard, and 60 of 81 of the combined state-listed Lepidoptera in Massachusetts and Connecticut. Most of these and more than 70 unlisted species are associated with a range of regionally or globally threatened sandplain communities—Pitch Pine-Scrub Oak barrens, sandplain grasslands, and maritime heathlands—that have been a longstanding topic of discussion among conservation planners throughout the northeast. Among those sandplain- and wetland-associated species that have undergone declines, at least 10 represent regional records (e.g., *Lycia ypsilon*, *Ptichodis bistrigata*) or species extirpated or historically absent from mainland Massachusetts or New England (e.g., *Eacles imperialis*, *Heterocampa varia*, *Metarranthis apiciaria*, *Phytometra rhodarialis*, *Spilosoma dubia*). Associates of grassland and coastal wetland habitats in particular are over-represented among those species now believed extirpated from Martha's Vineyard itself, including *Speyeria idalia*, *Digrammia eremiata*, *Pyrrhia aurantiago*, *Papaipema stenocelis*, and *Melanapamea mixta*.

Sun-PM2-D-1

## **Exotic herbivore interactions: Scaling Down from Landscape Patterns to Plant and Insect Responses**

**Liahna Gonda-King** (University of Rhode Island, Kingstown, RI; lgonda-king@my.uri.edu), Sara Gomez (University of Rhode Island, Tufts University), Laura Radville (Penn State), and Evan Preisser (University of Rhode Island)

In the eastern United States, Eastern hemlock, *Tsuga canadensis*, is a shared host for two exotic hemipteran specialist herbivores: Hemlock Woolly Adelgid (*Adelges tsugae*; "HWA") and the Elongate Hemlock Scale (*Fiornia externa*; "EHS"). Although EHS and HWA are both sessile phloem-feeding herbivores, they have enormously different effects on tree health. EHS reduces hemlock growth, but rarely causes tree mortality. In contrast, HWA is generally present at lower densities than EHS but rapidly kills mature hemlocks. The goal of this research was to examine interactions between these two invasive insects. Specifically, we looked at (1) how the co-occurrence of both species affect the survival and density of the other, and (2) how does tree health change as a function of insect combinations. To address the first question, we conducted a common garden experiment, a preference experiment in the laboratory, and an observational field study. We found that trees previously infested with EHS have 40% lower HWA populations and that HWA actively avoid foliage infested with EHS. To address the second question, we analyzed several physiological and chemical traits ( $H_2O_2$  production, wood anatomy, amino acid content, N allocation) of trees infested with one or both insects. In trees infested with HWA we noted a greater  $H_2O_2$  production, more abnormal wood anatomy, altered amino acid content, and differences in N allocation as compared to trees infested with EHS.

Sun-AM2-A-2

## **Lake Champlain Zooplankton Community Dynamics Following an Extreme Flood Event**

**Erin Hayes-Pontius** (Lake Champlain Research Institute; SUNY Plattsburgh), Timothy Mihuc (Lake Champlain Research Institute; SUNY Plattsburgh), and Mark LaMay (Lake Champlain Research Institute; SUNY Plattsburgh)

Lake Champlain experienced two major flood events in 2011 that increased turbidity: a record spring flood and a major fall storm brought on by Tropical Storm Irene. The impacts of extreme flooding on large temperate lakes are poorly understood. In this study, we documented patterns in zooplankton abundance, species traits, and seasonality associated with the 2011 Lake Champlain floods. We observed major shifts in community composition associated primarily with increased turbidity. Density patterns varied from a negative response (e.g., *Daphnia retrocurva*), to remaining unaffected (e.g., *Diacyclops thomasi*), to responding positively (e.g., *Ceriodaphnia* spp.). The timing of responses varied within groups from immediate to delayed; this result was likely a product of life-cycle length. Those responding positively or neutrally may be able to withstand turbid conditions associated with flooding. Lake Champlain zooplankton responses to 2011 flood events suggests that increased flooding under future climate-change scenarios will impact large lake communities.

Mon-PM1-C-4

## **The Effect of Relocation on Eastern Box Turtle Home Ranges and Movement Patterns**

**Megan Henriquez** (Fordham University, mhenriquez6@fordham.edu), J. Alan Clark (Fordham University, Bronx, NY), Michael Rubbo (Teatown Lake Reservation, Ossining, NY), and Erin Baker (Teatown Lake Reservation, Ossining, NY)

The relocation of organisms is used increasingly as a major conservation management tool. However, little is known about the effectiveness of relocations, how relocations affect the ecology of relocation sites, or how relocations affect resident individuals of the same species. Eastern Box Turtles (*Terrapene carolina*) are often rescued and relocated into new habitats. How relocated turtles in the northeastern United States habituate to their new environment or how the addition of new individuals affects native turtle populations is unknown. To address these questions, we used radio telemetry to track a population of relocated and resident Eastern Box Turtles in order to assess home-range size and movement patterns at Teatown Lake Reservation in southeastern New York State. Six turtles resident to the study site were tracked from April through July 2012. Six turtles of unknown origin were relocated to and released at the study site in mid-June 2012 and tracked through the end of July 2012. All turtles, both resident and relocated, were tracked 2–3 times per week. We found that relocated turtles had larger home ranges and traveled farther per day, while native turtles traveled further overall but within a smaller area. The results of this study suggest that relocated turtles may have difficulty acclimating to their new environment. Additional research is needed to better understand the effects of increasingly common relocation efforts on both relocated and resident individuals.

Sun-PM2-C-1



## **Myrmecochory and *Corema conradii* at the Cape Cod National Seashore**

**Erin Hilley** (Antioch University of New England, Keene NH; ehilley@antioch.edu) and Rachel Thiet (Antioch University of New England, Keene NH)

Myrmecochory (ant seed dispersal) is a principal seed dispersal mode of many plant species worldwide and is prevalent in certain ecosystems. Ant seed dispersal is well established in xeric environments of Australia and South Africa; however, little research has been conducted on ant seed dispersal in the xeric-like coastal environments of northeastern North America. Here, ants may play a significant role in dispersing the seeds of *Corema conradii* (Broom Crowberry), an important species of threatened coastal heathland ecosystems. We conducted field studies at Cape Cod National Seashore to evaluate whether *C. conradii* is dispersal-limited without the dispersal activity of ants, and whether the season of prescribed burns affects the relationship between ant seed dispersal and *C. conradii* seedling density and spatial distribution. We observed that mature *C. conradii* fruits with elaiosomes drop from parent plants to the ground and are then dispersed by a variety of ant species. The distances and locations that ants dispersed fruits away from parent plants were consistent with the distance and location seedlings occurred away from the parent plant; however, the distances that ants dispersed fruits, location of seedlings, and the primary species of ants dispersing fruits varied by burn season. Our findings suggest ants are the primary biotic disperser of *C. conradii* fruits and that without the aid of ants transporting fruit to locations away from the parent plant, *C. conradii* reproductive success would be dispersal-limited. Additionally, prescribed burning may impact the long-term recovery of *C. conradii* and similar vegetation of heathlands and related plant communities. These findings highlight the importance of conservation practices and management decisions that preserve the sensitive ecological interactions among species and their abiotic environments.

Mon-AM1-B-2

## **Declines of Aerial Insectivorous Birds in the Northeast: A Call to Action**

**Pamela Hunt** (NH Audubon, phunt@nhaudubon.org)

Aerial insectivores are those birds which capture insect prey on the wing, and in the Northeast include nightjars, swifts, flycatchers, and swallows. Over the last 5-10 years, it has become increasingly recognized that many birds in this foraging guild are declining at alarming rates – often higher than those of other species identified as conservation priorities. Canada has already listed three species [Chordeiles minor (Common Nighthawk), *Chaetura pelagica* (Chimney Swift), and *Contopus cooperi* (Olive-sided Flycatcher)] as threatened or endangered, and further listings are likely. A recent revision of priority species lists for the northeastern United States added several still common species [e.g., Chimney Swift, *Riparia riparia* (Bank Swallow), *Hirundo rustica* (Barn Swallow), and *Petrochelidon pyrrhonota* (Cliff Swallow)] in addition to species already recognized as state or regional “Species of Greatest Conservation Need.” In this presentation I will provide an overview of the declines and potential threats, a summary of work going on in the Northeast, and issue a call to action for collaborative and coordinated monitoring, research, and outreach to agencies and organizations working in this region.

Sun-AM2-D-4

## **Eastern Spadefoot Toad Restoration: Habitat Creation, Reintroduction, Translocation, and Monitoring Techniques**

**Ian Ives** (Mass Audubon, Barnstable, MA; [iives@massaudubon.org](mailto:iives@massaudubon.org)) and **Bryan Windmiller** (Grassroots Wildlife Conservation, Concord, MA; [bwindmiller@gmail.com](mailto:bwindmiller@gmail.com))

The Eastern Spadefoot Toad, *Scaphiopus holbrookii*, is the rarest frog species in Massachusetts; its status in the state is “threatened”. The Massachusetts Natural Heritage and Endangered Species Program reports only 32 known populations of Eastern Spadefoot from the state, with the greatest concentration in the lower Cape Cod “Provincelands” (North Truro and Provincetown). This multi-partnered and multifaceted project has begun to locally enhance the status of this threatened species through augmenting or creating new breeding populations of Eastern Spadefoot at Mass Audubon’s Ashumet Holly Wildlife Sanctuary in East Falmouth. Evidence of an established breeding population was documented at Ashumet as recently as the early 1970s, but has since crashed. Since 2011, we have created four 1250 ft<sup>2</sup> vernal pools through mechanical excavation and the insertion of a waterproof pond liner on the basin bottoms. In 2011 and 2012, we introduced late-stage Eastern Spadefoot tadpoles and young toadlets at the site. The Spadefoot Toads were collected as early stage larvae from Sandy Neck Barrier Beach in Barnstable, a population site we have been censusing since 2009. Survival of the transplanted toads was increased by headstarting the tadpoles at local schools. To date, results of the headstarting procedures show that the species can easily be reared and released. The constructed vernal pools look and function similar to natural wetlands, with the desired hydro-period, aquatic vegetation, and animal life. We will continue introductions of Spadefoots annually over the next 3 years and are involving students, wetland professionals, educators and volunteers in the monitoring and learning phase of the project. Monitoring of translocation success including breeding activity is being carried out through digital sound recording devices, drift fence and pitfall trap systems, and quantified dip net surveys. In our human-dominated world, we believe that direct hands-on intervention to help vulnerable plant and animal species is often necessary. Success of this multifaceted project will be defined in ecological and human terms.

Sun-AM1-B-2

## Roseroots, Saxifrages, and Anemones: Similar Subarctic Species Doing Very Differently

**Jerry Jenkins** (Wildlife Conservation Society Adirondack Program, Eagle Bridge, NY; [jcjenkins@hughes.net](mailto:jcjenkins@hughes.net))

The Northeast has 100 species of boreal and subarctic plants. The geography of their ranges suggests high vulnerability to warming climates; the ecology of their occurrences does not. *Sedum rosea* (Roseroot) and *Saxifraga paniculata* (White Mountain Saxifrage), near their southern range limits on the cliffs at Mt. Horrid, VT, were mapped in 1994 and 2008. Within the accuracy of the survey, there were no changes in the abundance of either species. Here, perhaps, ecology is trumping climate. *Anemone multifida* (Cut-leaved Anemone), at its southern range limits in the gorge of the Winooski River in Winooski, VT, was mapped in 1988; individual plants were followed annually till 2004 and at intervals since then. Here, climate is trumping ecology. Over 24 years, the population has declined by around 80%. Regeneration has been uniformly low, at or below replacement levels; dynamics have been controlled by spikes in mortality that correlated with dry summers. This may be the only incidence of a decline of a northeastern species, plant or animal, that can be quantitatively attributed to climate change. It indicates the power and importance, of individual-level monitoring. These contrasting stories suggest two conclusions: first that presence-absence monitoring is a crude tool for detecting climate-driven declines; and second that the geography of range boundaries is an equally crude tool for predicting them.

Sun-PM2-A-3

## Predicting Core Reproductive Habitat for Wolverine in Quebec, Canada

**Lori Johnson** (UMass Amherst, Amherst, MA; [lorijohnson@eco.umass.edu](mailto:lorijohnson@eco.umass.edu)), Lisabeth Willey (UMass Amherst, Amherst, MA, [lwilley@cns.umass.edu](mailto:lwilley@cns.umass.edu)), Michael Jones (UMass Amherst, Amherst, MA, [mtjones@bio.umass.edu](mailto:mtjones@bio.umass.edu)), and Florencia Sangermano (Clark University, Worcester, MA, [fsangermano@clarku.edu](mailto:fsangermano@clarku.edu))

The status of *Gulo gulo* (Wolverine) in eastern Canada was designated as Endangered in 2003. We have employed GIS and remote-sensing methods to develop a reproductive habitat model to precede surveys planned for Quebec and inform conservation planning for this species. The Otish and Groulx Mountains were selected for study due to their relative accessibility for both aerial and camera-trap surveys as well as the high likelihood of this region to support a remnant population due to the presence of extensive alpine tundra. Variables important to the selection of Wolverine denning habitat in montane ecosystems, including those related to snow cover, the alpine-treeline ecotone, topographic ruggedness, and distance from human activity were developed as GIS datalayers at 30-m resolution and incorporated into a deductive model. Multi-criteria evaluation methods were used to re-scale, weight, and then aggregate the variables through ordered weighted averaging. Spring snow persistence, developed from Landsat-5 (TM) imagery over three years, was considered to be the most influential variable. Our habitat model suggests that portions of the study area do contain late-lying snow required for denning and that the western massif of the Groulx Mountains contains the highest densities of high-quality reproductive habitat. The Otish Mountains provides a relatively small amount of suitable habitat largely due to minimal spring snow persistence. The results of this study validate future survey efforts in this area to potentially document Wolverine presence, as well as set a priority for permanent land protection within the Groulx Mountains.

Mon-PM1-A-2

## **Ecological Investigations of the Monts Groulx (Uapishka Plateau), Québec: Developing a Rapid Assessment Protocol for Remote Alpine Ranges**

**Michael T. Jones** (Massachusetts Cooperative Fish and Wildlife Research Unit, University of Massachusetts, Amherst, MA; mtjones@bio.umass.edu) and **Lisabeth L. Willey** (Massachusetts Cooperative Fish and Wildlife Research Unit; University of Massachusetts, Amherst, MA, lwilley@cns.umass.edu)

Alpine ecosystems, bounded at lower elevations by the climatic treeline and at high elevations by the upper limit of plant growth, are globally rare, representing less than 3% of the total land area. The alpine ecosystems of eastern North America are broadly distributed in relatively small patches along the Appalachians from New Hampshire, USA to Newfoundland, Canada, and on massifs of the Canadian Shield from New York, USA to Québec and Labrador, Canada. Although several alpine mountain ranges in eastern North America have been well studied in the past century (including the Adirondack Mountains in New York, the Presidential Range in New Hampshire, Katahdin in Maine, the Monts Chic-Chocs and McGerrigle in Québec, and Gros Morne in Newfoundland), the full extent of alpine ecosystems has not been comprehensively catalogued, and some mountain ranges are relatively little-known. The Monts Groulx ("Uapishka") of central Québec encompass some of the largest contiguous mosaics of alpine communities occurring east of the Rocky Mountains and south of the cordilleran ecosystems of northern Labrador, and have been only cursorily studied. Between 2008–2011, we undertook baseline field surveys of plants, amphibians, and mammals above treeline on the Groulx massif. We assessed arctic-alpine vegetation using a combination of plot-transect sampling and haphazard sampling at snowbed and summit locations. We also conducted visual and auditory surveys for amphibians and deployed acoustic recorders at two alpine ponds. We also conducted a two-year survey of large mammals using a network of trail cameras, with the objective of assessing the presence and distribution of *Gulo gulo* (Wolverine), *Martes americana* (American Marten), *Rangifer tarandus* (Woodland Caribou), and other boreal taxa. Our preliminary findings support previous assertions that the Monts Groulx massif and nearby montane ecosystems should be a regional conservation priority. We are refining our "rapid assessment" protocol to be more easily replicated for comparative purposes in the future, and to be more easily implemented at other remote ranges in the eastern alpine region.

Mon-PM1-A-1

## **Distribution and Phenology of Barrens Buck Moth, *Hemileuca maia* (Drury), in the Albany Pine Bush Preserve**

**Georgia R. Keene** (SUNY-ESF, Syracuse, NY; grkeene@syr.edu), Dylan Parry (SUNY-ESF, Syracuse, NY, dparry@esf.edu), H. Brian Underwood (SUNY-ESF, Syracuse, NY, hbunderw@syr.edu), and Neil Gifford (Albany Pine Bush Preserve Commission, Albany, NY, ngifford@albanypinebush.org)

At its northern range edge, *Hemileuca maia* (Inland Barrens Buck Moth) is a specialist on *Quercus ilicifolia* (Scrub Oak) and *Quercus prinoides* (Dwarf Chestnut Oak) in xeric pine barrens habitats. The presence or absence of this species is considered an indicator of Pitch Pine-Scrub Oak barrens health, and various agencies rely on adult flight counts as an index of population abundance. The interpretation of these counts is problematic and their relationship to actual population density is unknown. Clusters of the gregarious early-instar larvae are relatively fixed in space and time for 2–3 weeks and may provide more precise counts that allow for estimation of population density. Our objectives were to (1) determine an optimal sampling methodology for this life stage, and (2) assess the relative distribution of buck moth among different management compartments in the Albany Pine Bush Preserve. Five sites were censused for larval clusters using line transect and adaptive sampling. Larval density from spring 2012 was highly correlated with adult flight counts at the same sites from fall 2011 ( $R^2 = 0.87$ ,  $P = 0.02$ ), suggesting that adult counts may in fact have utility as a monitoring metric. Buck moth were more abundant in habitats that have been managed to reduce Scrub Oak density (growing season mow and burn followed by selective herbicide application), as opposed to unmanaged sites or those subjected to only mowing and burning, although relatively few sites were examined. Large phenological differences were observed between buck moth larvae feeding in frost-prone “kettleholes” and those feeding on ridgetops. Larval developmental stage was positively correlated with elevation at the sites sampled ( $R^2 = 0.635$ ,  $P = 0.001$ ), suggesting that interactions with microhabitat warrant further investigation.

Sun-PM2-D-2

## **Bee Richness and Abundance of Penikese Island and Cuttyhunk Island of the Elizabeth Islands, Massachusetts**

**Sean M. Kent** (Department of Biology, Northeastern University, Boston, MA; smkent22@gmail.com), John Ascher (Division of Invertebrate Zoology, American Museum of Natural History, New York, NY; ascher@amnh.org), and Gerald I. Stage (Stafford Springs, CT; jerrystage@aol.com)

Threats to pollinators are of concern worldwide, and in North America, certain bumble bee (*Bombus*) species have declined abruptly, but few studies have assessed changes in the status of native bee populations across decades. We describe the richness and abundance of bees of Penikese and Cuttyhunk Island, members of the Elizabeth Island chain, Buzzards Bay, MA, surveyed in 2009 and 2010. We compared this study with surveys conducted from 1973 to 1976 at both islands to examine changes in community composition. In total, 6915 individual bees (3063 from 1973–1976, and 3852 from 2009–2010) of 115 species were collected. A total of 112 species were collected from Cuttyhunk (1973–1976: 74 species, 2009–2010: 96 species) and a total of 89 species were collected from Penikese (1973–1976: 66 species, 2009: 74 species). There were 75 species recorded on both islands, and 27 species were recorded only on Cuttyhunk Island and 13 species recorded only on Penikese Island. Honey bees (*Apis mellifera*) were only observed on Cuttyhunk Island during the 2009–2010 survey. Ten bumble bee (*Bombus*) species were collected on each island during the 1970s, but five of these, *Bombus affinis*, *B. pensylvanicus*, *B. terricola*, and two social parasites, *B. ashtoni* and *B. citrinus*, were not collected during 2009–2010. It is quite likely that four of these species, not including *B. citrinus*, are extirpated from both islands as these are known to have declined across the region including other nearby island and mainland sites. Furthermore, the general bee fauna is dynamic and interesting, including regionally scarce species such as *Hylaeus schwarzii* and *Anthophora walshii*.

Mon-PM2-A-3

## **Invasive Species Prevention Zones a Tool for Prioritizing Management**

**Brent Kinal** (New York Natural Heritage Program, Albany, NY; kinal@nynhp.org)

Invasive Species Prevention Zone (ISPZ) is a formal designation for areas managed by New York State's eight Partnerships for Regional Invasive Species Management (PRISM) to delineate priority areas for invasive species early detection and rapid response efforts. ISPZs are areas known to support high quality ecological communities supporting exceptional biodiversity that would be adversely impacted by invasives. The goal of developing ISPZs is to assist PRISMs to appropriately allocate limited invasive species management resources to sites where management can have the greatest and most successful impact. The delineation of ISPZs is conducted specific to the PRISM due to the varying size and number of high quality communities across all PRISMs. Criteria used to establish ISPZs include the relative absence of invasive species, ownership and level of protection, as well as minimum size of the site under consideration. This presentation will discuss the site-selection criteria, and how the New York State Invasive Species Database Program is using geographic information systems to assist PRISMs with the establishment ISPZs.

Sun-PM2-B-1

## **Reporting New Invaders to Databases Used in the Northeast, EDDMapS and iMapInvasives**

**Brent Kinal** (NY Natural Heritage Program, Albany, NY; kinal@nynhp.org) and **Karen Lombard** (The Nature Conservancy)

This presentation will explain portions of the procedure for reporting invasive species observations into one of the two online databases presently serving the states involved. Karen will review EDDMapS, managed at the University of Georgia's Center for Invasive Species and Ecosystem Health, and Brent will present features of iMapInvasives, a collaborative effort headquartered with the New York Natural Heritage Program.

Sun-PM1-B-2

## **Wood Thrush Nesting Success and Postfledging Survival in Suburban and Forested Landscapes**

**David I. King** (US Forest Service Northern Research Station, UMass, Amherst, MA; dking@fs.fed.us), Scott Schlossberg (UMass, Amherst, MA; srs@eco.umass.edu), Stephen DeStefano (Massachusetts Cooperative Fish and Wildlife Research Unit, UMass, Amherst, MA; sdestef@eco.umass.edu), Paige Warren (Department of Environmental Conservation, UMass, Amherst, MA; pswarren@eco.umass.edu), and Mitch Hartley (US Fish and Wildlife Service, Hadley, MA; mitch\_hartley@fws.gov)

Forests throughout the US are being lost to urban and suburban development, which threatens forest-dependent wildlife populations. Many municipalities are attempting to counter this loss by establishing conservation areas. Acquisitions are often opportunistic, however, and it is not clear whether these efforts are effectively conserving forest-dependent wildlife, and what characteristics of conservation areas are most closely associated with the abundance and vital rates of forest species. In order to provide information to guide these conservation efforts, we studied Wood Thrush (*Hylocichla mustelina*) populations in 10 suburban conservation areas in central Massachusetts, and compared abundance, nesting success, and fledgling survival with populations in nearby extensively forested areas unaffected by development. During the two years of the study, we located and monitored 145 Wood Thrush nests. Daily nest survival was >97% and similar between suburban conservation areas and rural forested areas. Parasitism by Brown-headed Cowbirds (*Molothrus ater*) was observed only in suburban conservation areas, where 16% of nests were parasitized. We radio-marked 130 Wood Thrush fledglings. Fledgling survival to independence was also similar between suburban conservation areas and forested areas. Abundance, nest survival, and fledgling survival varied substantially among conservation areas, and appeared to be negatively affected by isolation from larger forested areas and proximity to areas with livestock. These findings suggests that efforts to conserve forest-dependent wildlife through the establishment of suburban conservation areas can be effective; however, proper siting relative to existing forest and agricultural areas is important in influencing conservation outcomes.

Sun-AM2-C-2

## **Eastern Hognose Snakes and Fuels Reduction Treatments in Pitch Pine-Scrub Oak Barren in Central Massachusetts**

**David I. King** (US Forest Service Northern Research Station, UMass, Amherst, MA; dking@fs.fed.us), Robert T. Brooks (US Forest Service Northern Research Station, University of Massachusetts Amherst, Amherst, MA; rtbrooks@fs.fed.us), and Michael E. Akresh (Department of Environmental Conservation, University of Massachusetts Amherst, Amherst, MA; makresh@eco.umass.edu)

Snake species worldwide are experiencing population declines as the result of habitat destruction and other anthropogenic influences. *Heterodon platirhinos* (Eastern Hognose Snakes) are considered a species of conservation concern in the Northeast as the result of its association with rare and declining habitats such as Pitch Pine-Scrub Oak barrens, grasslands, young forests, and shrublands. These are disturbance-dependent habitats that require management to persist. We studied Eastern Hognose Snakes on a pitch pine-scrub oak barren from 2008–2012 at the Montague Plains Wildlife Management Area in central Massachusetts to establish baseline population parameters as well as to describe the effects of habitat restoration and fuels management on their populations. We captured 52 hognose snakes over the study period, of which 43 were marked with PIT tags and 12 with coelomically implanted radio transmitters. Of the 43 snakes that were tagged, we resighted two. Of the 12 snakes that were radio-marked, we observed three mortalities from predation. If we assume snakes are vulnerable to predation for 150 days a year, the active period at our sites, this yields an annual survival rate of 61%. Minimum convex polygon estimates of home-range size averaged 19.3 ha, and were substantially larger for females (24.9 ha) compared to males (11.0 ha). Of 377 telemetry locations, 10% were in untreated Pitch Pine forest, 43% in thinned (restored) Pitch Pine, 32% in Scrub Oak barrens, and 11 % in other habitats, suggesting that treated forest and Scrub Oak habitats we selected for. Based on our results, we conclude there is a substantial population of Eastern Hognose Snakes at the Montague Plains, that survival rates are within the range of similarly sized snakes in this region, and that habitat restoration activities in the form of thinning is increasing the amount of habitat available for this species.

Mon-AM2-D-3

## **Hydraulic Fracturing Threats to Species with Restricted Geographic Ranges in the Eastern United States**

**Erik Kiviat** (Hudsonia Ltd, Annandale NY; kiviata@bard.edu) and Jennifer L. Gillen ()

High-volume horizontal hydraulic fracturing (HVHFF) is a new technology that poses many threats to biodiversity. Species that have small geographic ranges and a large overlap with the extensively industrializing Marcellus and Utica shale-gas region are vulnerable to environmental impacts of fracking, including salinization and forest fragmentation. We reviewed the ranges and ecological requirements of 15 species (1 mammal, 8 salamanders, 2 fishes, 1 butterfly, and 3 vascular plants), with 36%–100% range overlaps with the Marcellus-Utica region to determine their susceptibility to shale-gas activities. Most of these species are sensitive to forest fragmentation and loss or to degradation of water quality, two notable impacts of HVHFF. Moreover, most are rare or poorly studied and should be targeted for research and management to prevent their reduction, extirpation, or extinction from human-caused impacts. We expect the impacts of HVHFF on biodiversity to be cumulative with impacts of coal mining, logging, agriculture, land development, and climate change.

Sun-PM1-C-4



## **More Than Catch Statistics: The Importance of Historical Observations for Understanding Marine Ecosystem Change**

**Emily Klein** (Natural Resources & Earth Systems Science, University of New Hampshire, Durham, NH; emily.klein@unh.edu), **William Leavenworth** (Ocean Process Analysis Lab, University of New Hampshire, NH, and Department of Environmental Conservation, University of Massachusetts, Amherst, MA; william.leavenworth@gmail.com), and **Karen Alexander** (Ocean Process Analysis Lab, University of New Hampshire, NH, and Department of Environmental Conservation, University of Massachusetts, Amherst, MA; piscepuella@gmail.com)

For well over a decade, historical marine ecology has consistently demonstrated vast transformations in marine ecosystems worldwide from conditions that existed in the past. It can provide knowledge critical for evaluating current system health and envisioning future recovery scenarios. However, the application of historical marine ecology to contemporary fisheries science and management often focuses on analyzing quantitative data sets. This data is only half the story. Early fisheries managers and fishermen constantly reported on the world around them, providing expansive descriptions of their contemporary ecosystems and fisheries. This qualitative information is a vital, yet underused, source in ecology and management for understanding the past. Current research in the Bay of Fundy and Gulf of Maine exemplifies the importance and usefulness of qualitative information. Narratives constructed from this information provide key insight on how and why fish populations and human communities changed over time, in particular documenting the loss of economically and ecologically vibrant inshore grounds. They also show how people interacted with and responded to both the changing marine environment and each other. These narratives are critical for data analysis and synthesis, as they present the context necessary for investigating the quantitative data and can aid in refining quantitative methods. They may therefore be critical for drawing accurate conclusions from results. Consequently, accessing and utilizing multiple forms of past information deepens our understanding of ocean systems through time and improves statistical analysis and ecosystem modeling.

Mon-PM1-D-1

## **The Influence of Grazing on Species Richness in the Plant Community: The Role of Canopy Reduction**

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During the past five years, our investigations into the use of targeted grazing (TG) by livestock to suppress the spread of invasive plants have revealed that suppression of the invasive is accompanied by a 25–90% increase in species richness (S) relative to adjacent ungrazed reference sites, over a 24–60 day grazing period. This rapid increase in S might be attributable to the reduction in canopy height and cover, to reseeding by the livestock (unlikely due to our protocol), to microbial activity, or to some combination of factors. In this study, we tested the hypothesis that increased S accompanying TG is associated with canopy and invasive cover reduction. Five data sets, collected between 2008 and 2012 were used to address the hypothesis. The dominant invasives in each data set were: *Lythrum salicaria* (Purple Loosestrife) and *Phalaris arundinacea* (Reed Canary Grass; 2 data sets); *Phragmites australis* (Common Reed; 2 data sets), and *Persicaria perfoliata* (Mile-a-Minute; one data set). Densely stocked (4–8 ton-equivalents ha<sup>-1</sup>) sheep were rotated at approximately 3-d intervals through a series of 4–9 enclosures (area = 400–2500 m<sup>2</sup>). Before and after the grazing season, and sometimes mid-season, canopy heights were measured (metered tape) at 10–20 randomly selected locations in each grazed and ungrazed enclosure, and cover class analyses were performed in 10–12 randomly selected 0.25 m<sup>2</sup> quadrats in each enclosure. S was assessed in 12–20 quadrats. The relationship between S and the canopy-height or invasive-cover anomaly appears weakly inverse ( $r^2$  was never greater than 0.6). We hypothesize that the observed increase in S with grazing is driven by interactions among several factors.

Sun-PM2-B-2

## **Elevated Summer Temperatures Delay and Reduce Spawning by Resident Brook Trout (*Salvelinus fontinalis*)**

**Clifford E. Kraft** (Cornell University, Ithaca, NY; cek7@cornell.edu), Dana R. Warren (Oregon State University, Corvallis, OR; dana.warren@oregonstate.edu), and Daniel C. Josephson (Cornell University, Ithaca, NY; dcj3@cornell.edu)

Repeated spawning redd surveys for resident Brook Trout (*Salvelinus fontinalis*) were conducted annually in Adirondack mountain lakes in northern New York for eleven years. An individually based parametric model was fit to these data to estimate the day of year on which spawning was initiated, reached its midpoint, and ended during each year. Spawning phenology was then assessed relative to (1) mean of maximum daily air temperature and (2) mean of maximum daily water temperature at the lake bottom during summer in each year using a linear model. Elevated temperatures in summer were correlated with a delay in spawning and a reduction in the total number of redds constructed. A one degree C increase in maximum daily air temperature delayed spawning by approximately one week and decreased the total number of redds constructed by 65. Delayed spawning is likely to delay fry emergence, which could influence emergence synchrony with prey items. This work highlights non-lethal and sub-lethal effects of elevated summer temperatures on native resident salmonine fishes in aquatic environments with limited thermal refugia.

Sun-PM1-A-1

## **Differences in Behavioral Responses o Flash Photography by Birds in Urban and Non-urban Environments**

**David A. Krauss** (City University of New York, dkrauss@bmcc.cuny.edu) and Issa E. Salame (The City College of New York, salame@sci.cuny.cuny.edu)

It is well documented that birds living in urban environments exhibit differences in behavior from conspecifics in nearby non-urban settings. To date, these behavioral changes have been quantified in alterations to songs that make them more audible against the background noise of urban settings. Such evolutionary changes make sense in light of the variance of an urban setting from a more natural environment and it is therefore a logical prediction that bird behavior should exhibit adaptations to other variances of the urban environment. As part of a larger study, we investigated the differences between urban and non-urban birds' behavioral responses to flash photography. The urban environment is much more light rich than non-urban settings with the presence of street lights, well-lit buildings and strobing lights from various sources. In such a setting, it is a sensible prediction that birds should be more accustomed to disturbance by light and therefore exhibit lower levels of stress behavior in response to flash photography than birds in non-urban settings. Behavioral responses to flash photography were categorized and ranked and observations were made over the course of a year as birds were photographed by multiple photographers. It was found that there was no significant difference between urban and non-urban birds in their behavioral responses to camera flashes.

Sun-AM2-C-1

## **Spring Leaf Phenology, Insect Abundance and the Timing of Breeding by the Black-throated Blue Warbler**

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Phenological advances and trophic mismatches are among the most widely reported consequences of climate warming for many organisms, especially those living in seasonal environments. Such mismatches can occur if phenological advances differ among trophic levels such that resource demand by organisms becomes decoupled from resource supply. Here, we used 25 years of demographic measurements of *Setophaga caerulescens* (Black-throated Blue Warbler) to compare its breeding phenology to that of its caterpillar prey and the foliage on which caterpillars feed. Our study revealed that caterpillar biomass in this temperate beech-maple forest did not show a consistently timed seasonal peak; this occurs at least in part because the Lepidoptera community is highly diverse, with variable life histories and a wide array of larval feeding times. The warblers' first clutch initiation dates were not timed to coincide with maximum food availability for nestlings. Instead, the timing of first clutches was positively related to the timing of spring leaf expansion and to caterpillar biomass at the time of egg laying. However, the ability of this species to adjust the timing of breeding was one of the important determinants of annual fecundity even though its reproduction was not timed with peak food for nestlings. Our results suggest that this avian species and perhaps others in Northeastern temperate forests will be capable of adapting to climate change in the near term, and motivate more research on what causes changes in the overall abundance of forest Lepidoptera and why the richness and evenness of Lepidoptera communities may differ among forest types.

Mon-PM2-D-3

## **A Non-Invasive Method for Determining Mating Success in Female American Lobsters**

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Despite being one of the most productive fisheries in the Northwest Atlantic, much remains unknown about the natural reproductive dynamics of the American Lobster. Recent work in exploited crustacean populations suggests that there are circumstances where mature females are unable to achieve their full reproductive potential due to sperm limitation. To examine this possibility in different regions of the American Lobster fishery, we developed a reliable and non-invasive method for sampling large numbers of females at sea. We inserted a blunt-tipped needle into the seminal receptacle of females to both determine the presence or absence of a sperm plug and to detect sperm. The needle acted as a mini-coring device, removing a tiny core of plug material and the associated spermatozoa. A small amount of seawater (<0.5 ml) was used to flush the receptacle when possible, before depositing the sample with the added seawater into an Eppendorf tube for later analysis. In receptacles without a sperm plug, the needle encountered no resistance until reaching the bottom of the receptacle, where a sample of any material present was taken. To confirm that the method was reliable before applying it under field conditions, we conducted a series of control studies in the laboratory. We sampled a total of 294 female lobsters and dissected those seminal receptacles that yielded negative results to confirm the absence of sperm. A total of 93% of females had sperm plugs. In samples where females had sperm plugs but no sperm, dissections of the receptacle indicated that the sampler had not inserted the needle to a sufficient depth to collect sperm that was, indeed, present. Hence sperm plugs can be a reliable indicator of sperm in female receptacles. At-sea sampling in GOM and RI showed that in the four GOM regions combined (ME to MA), 172 of the females sampled had fertile egg clutches (detectable eye spots), and 98.8% of these females were SP. Thirty-two egg-bearing females (with fertile clutches) were sampled in the two RI regions, 90.6% of these were SP. These data provide evidence that the sperm plug does persist post-fertilization.

Sun-AM2-B-1

## **Reducing the Threat from Invasive Plants within a Large Forested Landscape: Lessons Learned from an 11-year Control Project**

**Karen Lombard** (The Nature Conservancy of Massachusetts, Boston, MA; klombard@tnc.org) and Jessica Murray Toro (Native Habitat Restoration, LLC, Stockbridge, MA, nativehabitatrestoration@gmail.com)

From 2002–2012, The Nature Conservancy (TNC) implemented Weed It Now (WIN), an ambitious \$1 million effort to remove invasive plants from nearly 10,000 acres of forest habitat on the Berkshire Taconic plateau, which includes portions of CT, MA, and NY. Initial research on 36,000 acres in 1999 showed that over 54% of the forest was invaded to some degree by at least one of ten invasive plant species. Of 24,400 acres of forest of the greatest conservation significance within the 36,000 acres, roughly 10,000 acres were considered highly invaded. The WIN Project focused control efforts on these 10,000 acres with the goal of reducing the density of invasive species to less than 5%. Over the eleven-year project, TNC identified and treated 2874 acres of invasive species on 9834 total property acres evaluated.

Mon-AM2-B-2

## **Geographical Response of Tree Growth to Climate at Subcontinental Scales across a Humid, Temperate Deciduous Forest**

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Temperate humid forests have been normally considered more resilient to climatic changes because of their mesic conditions and seemingly stable climate. Understanding the climatic sensitivity of trees in these kind of forests at large-scales is essential to advance our knowledge of the effects of global change on forest growth, survival, and productivity from ecosystem to subcontinental scales. We conducted a dendroclimatic study of broadleaved tree species in the forests of the humid and temperate eastern United States to explore their response to precipitation, temperature, and drought in a large biogeographical context. We analyzed a network of 86 tree-ring width chronologies composed of eight species along a 1700-km latitudinal transect covering a wide range of ecological and climatic conditions. Across this transect, precipitation and mean temperature increased latitudinally from north to south. Our results showed that all species are sensitive to drought during the growing season. While precipitation and temperatures drive this drought response, the influence of these factors was not equal at all sites. A strong latitudinal gradient of the response of growth to climate exists within this network to produce the relatively constant drought response—precipitation is more strongly and positively correlated in the north, while temperature is more strongly and negatively correlated in the south. For example, a positive effect of warmer winter temperatures was evidenced for some species (e.g., *Liriodendron tulipifera* L.) and for certain sites, particularly in the Hudson River Valley towards the northern end of our study area and the high altitudes of the southern Appalachia. Ecological characteristics appeared more important than genetics in determining responses of trees to precipitation and temperature. Our results indicate that the projection of climate change impacts at large-scales requires the understanding of the full spectrum of climatic sensitivity beyond water balance. We found that common drought sensitivity is driven by temperature and precipitation differently over space. These finds will provide a more nuanced, and perhaps more accurate, forecast of the response of these forests to future climate changes.

Mon-AM1-A-2

## **Bats in the Bronx: An Acoustic Survey**

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Populations of many bat species are in serious decline. Although some bat species can adapt to urban environments, little is known about urban bat ecology, particularly in the Northeastern US. This study documented the presence of bats in the Bronx, NY, to determine which species use this urban environment and how species composition changes across seasons. We censused bats at five sites in the Bronx: The New York Botanical Garden, the Rose Hill campus of Fordham University, the highly urbanized Arthur Avenue neighborhood, and the Bronx Zoo. We surveyed each site using passive and active acoustic recorders designed to record ultrasonic bat vocalizations. During the summer of 2012, we conducted active surveys weekly at each site for two hours, beginning at sunset. From May 2012 until March 2013, we used passive recorders placed on rooftops to record from civil twilight to civil twilight. We determined species presence using an acoustic analysis software program. We have confirmed the presence of *Lasiurus borealis* (Eastern Red Bat), *L. cinereus* (Hoary Bat), *Eptesicus fuscus* (Big Brown Bat), and *Lasionycteris noctivagans* (Silver-haired Bat) in the Bronx. Further analysis is in progress to confirm the presence of additional species and to examine changes in species composition across seasons. Determining the presence and seasonal variation of bat species in the Bronx will greatly contribute to overall knowledge of urban bats and aid in improving management of urban spaces for bat conservation efforts.

Sun-AM2-C-4

## **Black Bass Dispersal after Tournaments on Lake Champlain**

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Lake Champlain is the sixth-largest freshwater lake in the US, and it is consistently ranked as one of the top bass lakes in the country by national anglers' interest groups. Black bass tournaments hosted on Lake Champlain increased in number, size, and popularity over the past decade, especially large-scale events hosted on Cumberland Bay, in Plattsburgh, NY. Local groups are concerned about the effects tournament release practices may have on fish populations in Cumberland Bay and the wider lake. 1141 Largemouth Bass (*Micropterus salmoides*) and 1160 Smallmouth Bass (*M. dolomieu*) were fitted with T-bar tags. Radio telemetry transmitters were inserted into 38 largemouth and 53 Smallmouth Bass. Fish were tracked following release near Plattsburgh after nine tournaments in the summers of 2011 and 2012. Overall, 56% of radio tagged Smallmouth Bass and 43% of radio tagged Largemouth Bass left the bay, although there was inter-annual variation in dispersal patterns. T-bar recaptures yielded an 8% return rate, with over half of the tag returns coming within the first month post-release. Results from both T-bar tagging and telemetry suggest that long-term stockpiling in Plattsburgh is not an issue. However, short-term stockpiling coupled with heavy angling pressure in Plattsburgh may warrant concern. Tournaments operating out of Plattsburgh should consider using a more removed release point to minimize angling vulnerability of bass post-release.

Sun-PM1-D-5

## **A Validated Model for Migratory Stopover Distribution in North America: Identifying Generalizable Predictors of Site Use**

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While we suspect that many aspects of the individual mechanisms determining migratory stopover in birds is generalizable across taxa, we lack a comprehensive predictive model that describes stopover epiphenomena at the landscape scale. It is clear, however, that individual migratory behaviors produce large-scale concentrations of refueling birds in many geographic locations. Predicting these migratory stopover distributions for North American landbirds has become an increasingly important conservation objective. Consequently, identifying factors that predict stopover use over the entire continent are ideal both for understanding migratory processes at the scale of the landscape as well as for developing broad, regionally relevant, management plans. Many mechanisms of stopover habitat use have been proposed, but these hypotheses remain largely unvalidated outside of the regional studies where they arose. In this study, we tested how well stopover predictors identified during fall passage along the Gulf of Mexico, the American Midwest, the coastal Southeastern United States explained stopover habitat use in the Gulf of Maine, a point much earlier in the migratory flyway. Using autumnal passerine stopover data from a five-year period (2007, 2009–2012) and 13 stopover sites across a 20,000-km<sup>2</sup> region of coastal Maine, we tested four general drivers of the regional distribution of fall migrants during stopover: 1) the characteristics of the pool of potential migrants, 2) a site's local geography, 3) habitat composition at the local landscape measured at different spatial scales, and 4) interactions between these factors. Our final, validated model revealed significant interactions between migratory community characteristics and two landscape metrics: proportional availability of vegetated lands and forest patch density at small (4 km) and medium (8 km) spatial scales, respectively. We found no further relationship between stopover habitat use and local geography once we had controlled for these interactions nor any unique patterns of habitat use within phylogenetic groupings once we had controlled for migratory strategy and foraging guild. Our results corroborate several studies from across North America suggesting that proportional habitat availability and the spatial composition of forested landscapes at small to medium scales (<10 km) are important predictors of migratory stopover decisions. Based on these general patterns it appears that landbirds are assessing stopover sites similarly at the northern and southern regions of their migratory route, and these generalities may be broadly applied for conservation across the continent.

Sun-AM2-D-1

## **Ejection strategies for the removal of parasitic cowbird eggs by a host species, the Warbling vireo (*Vireo gilvus*)**

**Renee McDonough** (Framingham State University, Framingham, MA; reneepaige3157@gmail.com) and Dr. Brandi Van Roo (Affiliation: Framingham State University, Framingham, MA; bvanroo@framingham.edu)

Warbling Vireos (*Vireo gilvus*) are the smallest species in North America known to eject parasitic cowbird eggs from their nests, however not all populations perform this behavior. Further, the intraspecific variation appears to possess geographic component, with acceptors in the west and egg-ejectors in the mid-continent. In an attempt to reconcile whether these population differences are the result of an evolutionary lag among populations or, rather, diversification between two subspecies, an appeal was made for studies in eastern populations. We experimentally parasitized a Warbling vireo nest in Massachusetts using a silicone-filled Brown-headed Cowbird (*Molothrus ater*) egg. We witnessed egg-ejection by the female, demonstrating that Warbling vireos in the east are egg-ejectors, similar to mid-continental populations and unlike egg-acceptor populations in the west.

Sun-AM1-D-2

## **Using Local Flora and Fauna to Teach Ecology and Systematics: An Example with Mosses**

**Karl B McKnight** (St. Lawrence University, Canton, NY; kmcknight@stlawu.edu)

Increasing the number of citizen scientists requires increasing the number of naturalist teachers. Cataloging the local species can be an excellent way to develop a love of nature and train new teachers. I will describe a journey from the first student project to learn the local mosses, to the publication of an innovative new field guide, *Common Mosses of the Northeast and Appalachians*. Examples of past and current research will be illustrated. We will also have a few minutes to hear your experiences and discuss future projects.

Mon-AM1-C-3



## Colonization of Natural Gas Pipeline Corridors by Timber Rattlesnakes

**Kathy Michell** (KT Wildlife, Narrowsburg, NY 12764; kmichell@hvc.rr.com), **Tom Michell** (KT Wildlife, Noxen, PA, tomorama@gmail.com), and **George Banta** (KT Wildlife, Beach Lake, PA, gwbanta@gmail.com)

Many of the 300,000 miles of natural gas pipeline in the US were built over 50 years ago, when environmental concerns were not a major factor in construction. Some of the pipelines were blasted directly through *Crotalus horridus* (Timber Rattlesnake) dens while others encroached on the peripheries of dens, damaging but not destroying them. Newly developed technology which has enabled access to the large reserves of shale gas underlying much of the country has resulted in a surge of new pipeline construction and upgrades to many other pipelines. Environmental impact studies are now being conducted for endangered and threatened species prior to new construction, and techniques such as crossovers, where the new pipeline crosses under an existing line to avoid critical habitat, are being used to prevent further damage to dens and gestating areas. Unanticipated results of survey work indicate that there are additional potential impacts to Timber Rattlesnakes. While conducting surveys in 2011 for new pipeline construction adjacent to an existing right of way, four post emergent Timber Rattlesnakes, including a juvenile, were observed on 27 April in an area where no den was known. Radiotelemetry of the three adults subsequently revealed that they were hibernating in two locations along the corridor of a 1950s pipeline which had been backfilled with shot rock creating a porous cavity accessible to the snakes. Survey work was continued through 2011 and 2012 incorporating the use of time-lapse cameras along with telemetry and confirming the use of these locations by three additional rattlesnakes. *Heterodon platirhinos* (Eastern Hognose Snake), *Coluber constrictor constrictor* (Eastern Racer), *Elaphe obsoleta obsoleta* (Eastern Rat Snake), and *Agkistrodon contortrix mokasen* (Northern Copperhead) were also observed on the pipeline corridor during emergence. In 2012, a natural rattlesnake den was located 1 km away that had probably contributed to the colonization. Pipeline corridor denning was also confirmed by telemetry in 2011 in a different pipeline 23 km away. This ongoing study will now focus on impacts of maintenance and replacement of the aging pipelines and how to best protect Timber Rattlesnakes which have colonized them.

Sun-PM1-C-2

## Time Lapse Camera Study of Timber Rattlesnake Emergence at an Undisturbed Den in the Northeast

**Tom Michell** (KT Wildlife, Narrowsburg, NY; tomorama@gmail.com) and **Kathy Michell** (KT Wildlife, Narrowsburg, NY; kmichell@hvc.rr.com)

Populations of *Crotalus horridus* (Timber Rattlesnake) have been studied extensively by various survey methods; often involving field visits into denning and gestating areas, handling and processing of individuals, as well as invasive procedures such as radio telemetry. These studies have provided a wealth of information regarding the species and its habitat. However, the human presence has been shown in some cases to alter the behavior of rattlesnakes during various stages of their annual cycle. In 2011, the authors had a unique opportunity to study a previously unknown Timber Rattlesnake den in the northeast with an entirely non-invasive procedure. After locating the den in 2010, all contact with the location was avoided until the spring of 2011 when a time lapse camera was placed at the den entrance. The camera was deployed for 6 weeks to capture the entire egress. Camera cards and batteries were changed weekly since the camera was set for one frame per minute, 24 hours per day. Time and temperature were recorded by the camera. No snakes were observed during those brief visits, nor were any surveys of the area conducted. The photos, approximately 10,000 per week, were transferred to a video program and professionally edited to create a fascinating glimpse into a totally natural emergence. The authors recognize that this technique has extreme limitations for its use due to the human presence at many known dens jeopardizing the equipment and leading to avoidance patterns, as well as due to the presence of multiple entrances at some dens formations.

Sun-PM2-C-2

## The Flora of Baxter State Park Project

**Glen Mittelhauser** (Maine Natural History Observatory, Gouldsboro, ME; [purplesandpiper@gmail.com](mailto:purplesandpiper@gmail.com))

Baxter State Park, with over 209,000 acres spanning 12 townships of mountainous wilderness and managed forest in northern Maine, is considered to be one of the most botanically diverse areas in Maine. Mount Katahdin, the most prominent feature in the Park, is well studied and known to support many rare and endangered plant species found nowhere else in the state, yet the plants of the rest of the Park are poorly documented. During the summer of 2012, we field tested a protocol for data collection for inventorying the vascular plants of the park that was conducted by teams of volunteers led by professional botanists. During the field testing, we identified numerous species not previously known from the Park and increased our knowledge of the distribution of species within the Park. Combining our 2012 survey results with historic botanical surveys brings the total list of plants documented for the Park to approximately 700 species, and this number is expected to increase as this study continues. Flora documentation of the Park by volunteer teams led by professional botanists is scheduled to continue for four more years.

Mon-PM2-B-4

## Conifer Swamps of Central and Western Massachusetts

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Conifer swamps dominated by Red Spruce (*Picea rubens*) or Eastern Hemlock (*Tsuga canadensis*) are uncommon in southern New England, occurring primarily at the higher elevations of central and western Massachusetts and in the highlands of northwestern Connecticut. These wetlands support several boreal species that are near their southern range limits in the region and may be vulnerable to warming temperatures and hydrological changes associated with climate change. Existing data and *de novo* field searches were used to document the distribution of conifer swamps in central and western Massachusetts. Field sampling in 41 wetlands was used to characterize vegetation variation and to develop hypotheses about environmental factors that may influence species composition. Conifer swamps are widely distributed on the Worcester and Berkshire Plateaus, but account for <1% of the study area. Conifer swamps frequently occur at the headwaters of perennial streams or on drainage divides; they also occur in isolated basins and, less frequently, along mid- to lower portions of streams. Depth of organic sediments exceeds 4 m in many sites. Red Spruce swamp, Hemlock swamp, and Rich Conifer swamp types have substantial overlap in vegetation composition, with high constancy of many species. Vegetation variation is related to elevation, with several northern species most common in high elevation spruce swamps. Although many conifer swamps are characterized by acidic, nutrient-poor conditions, several sites support indicators of moderate mineral enrichment. Red Spruce swamps in the region represent the southernmost extension of sub-boreal swamp communities in New England. The vegetation of Massachusetts spruce swamps is remarkably similar to that of northern New England and New York, with a few noteworthy differences. Several southern or coastal species that occur occasionally in Massachusetts spruce swamps are generally absent from more northern swamps (e.g., *Kalmia latifolia*, *Ilex laevigata*, *Nyssa sylvatica*, *Chamaecyparis thyoides*, *Gaylussacia frondosa*, *Woodwardia virginica*). Similarly, some widespread northern species are uncommon in Massachusetts spruce swamps, and appear to have become less common in the past century (e.g., *Linnaea borealis*). Small, isolated populations of such northern species may be particularly vulnerable to local extirpation in response to changing climate in the coming decades.

Sun-PM2-A-1

## **An Island Biogeography of Plant Traits**

**Luka Negroita** (Syracuse University, NY lnegoita@syr.edu), J.D. Fridley (Syracuse University, NY), G. Mittelhauser (Maine Natural History Observatory, Gouldsboro, ME), and M.V. Lomolino (SUNY ESF, Syracuse, NY)

Plant functional traits are an important driver of ecosystem processes and are increasingly used to quantify variation in community functioning. Although many studies have examined how plant functional traits vary across environmental gradients, few have tested how community functioning changes with spatial isolation. In this study, we used species composition data from 36 Maine coast islands to quantify growth forms and seed-dispersal strategies across a gradient of isolation. Our results provide compelling evidence that islands harbor a progressively disproportionate composition of growth forms and seed-dispersal strategies with increasing isolation. This study presents the preliminary exploration of a novel direction in island biogeography. Further studies examining the functional composition of islands will be crucial for the conservation of insular habitats — especially in light of climate change. Further results may also provide key insights about the ecosystem functioning of fragmented landscapes.

Mon-PM2-B-1

## **Heat-shock Protein Expression and Thermal Tolerance in *Aphaenogaster picea***

**Andrew Nguyen** (University of Vermont, Burlington, VT; adnguyen@uvm.edu), Sara Helms Cahan (University of Vermont, Burlington, VT; scahan@uvm.edu), and Nicholas J. Gotelli (University of Vermont, Burlington, VT; ngotelli@uvm.edu)

Future global warming scenarios predict that organisms will experience elevated thermal stress. The ability to respond to such stress is ultimately mediated at the molecular level. Species that span a large latitudinal range, such as the eastern forest ant *Aphaenogaster picea*, are ideal for investigating the molecular underpinnings of species responses to climate change and determining whether more southerly populations can serve as a source of temperature-resistance adaptations. One of the most conserved responses to thermal stress is the induction of heat shock proteins (HSPs), which protect other proteins from degradation under high temperatures. I investigated whether *A. picea* utilizes this type of response by constructing amino acid phylogenies and aligning the regulatory sequences of two HSPs (hsp90, hsp70) in seven ant species and 10 other insects across five orders. Whether these HSPs are involved in coping with high temperatures was determined by quantifying gene expression in *A. picea* workers exposed to increasing temperature regimes. Molecular analysis showed that ants possess novel forms of both hsp90 and hsp70, whose regulatory regions suggest inducibility to thermal stress. Consistent with these predictions, experimentally heated ants significantly upregulated both proteins. These results demonstrate that *A. picea* possesses a conserved response to thermal stress at the transcriptional level. Our next step will be to compare HSP expression across the latitudinal range of *A. picea*. These comparisons will reveal whether southern populations possess higher basal levels and/or higher inducibility that underlie greater thermal tolerance than northern populations.

Mon-AM1-B-1

## The Importance of Small Parks in the Urban Environment

Peter Nguyen (BMCC, Brooklyn, NY; pnguyen@bmcc.cuny.edu) and David Krauss (BMCC, Brooklyn, NY)

In urban environments, habitat islands are essential resources for wildlife. What has recently come to our attention is that very small and apparently depauperate islands can be of significant importance, especially to migrating birds. This issue was made apparent in the fall of 2012 when two locally rare species of salt marsh birds (Saltmarsh Sparrow and Nelson's Sparrow) were found in a monocultural reconstructed saltmarsh on the shore of Randall's Island in New York City. These birds brought many birders to the area and it quickly became obvious that this small (<0.3 hectare) plot not only attracted these rare species but was an important resource for a larger variety of more common birds than would have been predicted by most ecologists. It is well known that major city parks, like Central Park, Van Cortland Park, Forest Park, and Bronx Park are major resources for birds, especially during migration. After having our attention drawn to the issue of very small parks, we initiated an investigation of the smaller parks in the city and found that many of them attract a higher diversity of bird life than would be expected based on their resource profiles. Many of these parks have very high proportions of impervious surface, no water, and very few plant species all of which may be urban ornamental varieties. In spite of this low habit value, some of these small parks have surprisingly high species counts and nearly all of them attract more than the common three urban bird species (Rock Pigeon, Eurasian Starling, and House Sparrow). Most of the birds attracted to these small parks are migrants and either insectivorous, predatory, or omnivorous reflecting the nature of food sources available in such a limited environment. Their presence highlights the importance of microhabitat patches in urban environments and the possibility of using them for undergraduate research projects.

Sun-AM2-C-3

## Landscape-level Impact of Hemlock Woolly Adelgid on Forest Structure and Composition

David A. Orwig (Harvard Forest, Harvard University, Petersham, MA; orwig@fas.harvard.edu)

*Tsuga canadensis* (Eastern Hemlock) plays a unique role in Eastern forests, producing distinctive biogeochemical, habitat, and microclimatic conditions, and yet has begun a potentially irreversible decline due to the invasive *Adelges tsugae* (Hemlock Woolly Adelgid; HWA) that causes foliar damage, crown loss, and mortality of host trees. Understanding the regional, landscape, site, and stand factors influencing HWA spread and impact is critical for predicting future landscape dynamics and directing effective management. Using aerial photographs, we documented over 100,000 ha of hemlock forest from 6127 stands throughout central Connecticut and Massachusetts and subsampled 237 stands over time to examine the spatial pattern of HWA and its impact on tree vigor and mortality since its arrival in the mid-1980s. Average stand size was 53 ha, overstory basal area ranged from 19 to 80 m<sup>2</sup> ha<sup>-1</sup>, and overstory stem densities averaged 917 ha<sup>-1</sup>. In the study region, *Betula lenta* (Black Birch), *Quercus rubra* (Red Oak), *Acer rubrum* (Red Maple), and *Pinus strobus* (White Pine) were common overstory associates. Hemlock and HWA abundance increased from south to north, commonly on western and northwestern slopes. By 2004, HWA had infested most Connecticut stands visited, but only 40% of sampled stands in Massachusetts. Out of fifteen stand and landscape predictor variables examined, only latitude and winter climate variables were related to HWA density. Cold temperatures appear to be slowing the spread and impact of HWA at its northern extent, as HWA infestation intensity and hemlock mortality and vigor were significantly correlated with average minimum winter temperature. Permanent plots across the study area highlight that chronic HWA infestation (>15 years) lead to high (>80%) overstory and understory hemlock mortality in some but not all stands and Black Birch replacement of hemlock in most stands. Continued migration of HWA continues to pose a significant threat regionally, especially in the northern portion of the study area, where hemlock dominates many forests.

Sun-AM2-A-4

## Monadnock's Changing Summit

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Mount Monadnock, rising 3165 feet above the surrounding landscape in SW New Hampshire, is the icon of the region. Natural and human influences have shaped the plant communities of Monadnock's summit dramatically and slowly over the last two centuries. Plant communities have been exposed to repeated fires, soil erosion, and human recreation. Although forested just over 200 years ago, its nearly bare summit now supports subalpine vegetation. The obvious question, will and can the summit of Monadnock regrow the forest it once supported? We summarize the results of three studies that examine the current condition of the summit, its plant communities, and the potential for restoration via natural succession and human assisted methods. Twelve transects stratified by aspect were sampled to characterize the substrate, vegetation cover, soil depth, and species composition. Additionally, 14 vegetated and non-vegetated patches were examined using 0.25-m<sup>2</sup> plots to examine the condition of mildly and severely degraded patches. The transect sampling showed that bare rock covered 67% of the summit cone, with the remaining 33% holding enough soil to allow vegetative growth. Soil depth ranged from 0 to 64 cm, averaging 11.4 cm. Unfortunately, due to human trampling, 65% of the area that held soil supported less than 50% plant cover. At least 20 plant species occupied the summit including subalpine species *Agrostis mertensii* (Boreal Bent Grass), *Nemopanthus mucronatus* (Mountain Holly), *Minuartia greonlandica* (Mountain Sandwort), *Vaccinium vitis-idaea* (Mountain Cranberry) and *Juncus trifidus* (Highland Rush) with *Picea rubens* (Red Spruce) and even *Pinus strobus* (White Pine) appearing on the upper reaches of the mountain. With 100,000 visitors annually, the degradation to the area is not surprising and vandalized experiments prevented us from examining the effects of scarification, mulch, and jute mat on plant establishment. However, this attempt makes us ponder if alpine bent grass could be used to initiate succession. Clearly more research on restoration methods are needed as well as more effective visitor-management techniques. Without such measures, the subalpine environment of Monadnock and the plant species it supports may yield to lower elevation forest species, particularly in light of ongoing changes in our region's climate.

Mon-PM1-A-4

## The Frog of the North: Mink Frog Ecology and Climate Change

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Populations of the cold-adapted *Lithobates septentrionalis* (Mink Frog) are likely to be highly threatened by climate change. Despite this concern, little is known about this species. The goal of our research was to evaluate the effects of climate change on the range and persistence of the Mink Frog. Specific objectives included: (1) understanding how changes in water temperature and dissolved oxygen (DO) influenced larval survival; (2) establishing the current occurrence of this species in the Adirondack Park, NY; and (3) predicting the effects of climate change on the range and persistence of the species across its range. We initially employed a combination of laboratory studies and artificial mesocosms to determine relationships between aquatic conditions and growth and survival of larvae, and field studies at ≈80 wetlands across an elevational and latitudinal gradient to evaluate the current occurrence of the species. Our results indicated that occurrence of the species was not solely a function of abiotic conditions in the aquatic environment, but likely driven by strong indirect effects of climate change. Based on these results, we evaluated the role of climate-induced shifts in competition and predation using similar controlled experimentation. The results of these latter studies indicated that temperature-induced shifts in predator communities have the potential to dramatically influence survival of the focal species. Our results show that changes in amphibian populations as a result of shifts in global climate are likely to be driven by complex indirect effects across trophic levels.

Sun-PM1-A-2

## Effects of Seasonal Burning on *Corema conradii* Plant Survival and Reproduction in Southeastern Massachusetts

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*Corema conradii* (Broom Crowberry) is an evergreen subshrub of the Empetraceae family which grows on sandy or rocky sites of the North Atlantic Coast. It is regionally rare but locally abundant. In Massachusetts, at its southern range limit, *Corema* was recently delisted as a species of special concern and is most abundant on Cape Cod (CC) and the coastal islands. Studies and observations suggest that *Corema* reproduction is disturbance (particularly fire) dependent, with fire promoting germination from a seed bank. Additionally, *Corema* plants are extremely flammable, with leaves containing volatile compounds which promote intense burning. Many current populations of *Corema* are described as old (60–80 years), senescent, and declining due to a lack of fire disturbance. In 2009, we initiated a project to examine the effects for spring, summer, and fall burning on fire behavior, plant mortality, and seedling establishment of *Corema* on Cape Cod and Nantucket Island (ACK). We established 0.9-ha<sup>2</sup> plots with each plot burned once in spring, summer, or fall 2009 (for each season: CC,  $n = 3$  plots; ACK,  $n = 1$  plot). Plant cover and frequency were documented before and after burning in 2009, with seedling establishment monitored for three seasons post-treatment. All mature plants were initially killed by very hot fires in all three seasons. Overall, percent cover of live *Corema* was reduced to 0 and has not recovered. Frequency of individual plants within 1-m<sup>2</sup> subplots has recovered due to the establishment of large numbers of seedlings (apparently from the soil seed bank), with seedlings still germinating abundantly in spring 2012. Densities as high as 500–600 seedlings/m<sup>2</sup> in the spring appear to thin rapidly over the growing season due to desiccation during drought periods. Sampled plots showed slower seedling establishment following fall burns. Survival, on average, of as many as 3–6 seedlings/m<sup>2</sup> for 2–3 years has occurred, however. We have observed initial flowering in seedlings after only three years, and we will continue to monitor for seed production to determine minimum return intervals for subsequent burning.

Mon-AM1-D-4

## **Ecological Insights from Industrial Dendro: Missing Rings and the Importance of Seed Source in 36-year-old *Pinus rigida***

**Neil Pederson** (Tree-Ring Lab of Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY; [adk@ldeo.columbia.edu](mailto:adk@ldeo.columbia.edu)), Dario Martin Benito (Tree-Ring Lab of Lamont-Doherty Earth Observatory, Columbia University), Caroline Leland (Tree-Ring Lab of Lamont-Doherty Earth Observatory), John Hom (USFS Northeast Research Station), Nicholas Skowronski (USFS Northeast Research Station), F. Thomas Ledig (USFS Northeast Research Station), Ed Cook (Tree-Ring Lab of Lamont-Doherty Earth Observatory, Columbia University), and Paul Krusic (Stockholm University)

Despite decades of tree-ring research, it is not evident how anthropogenic climate change will impact the growth of most species. We cored 953 *Pinus rigida* trees from 27 seed sources planted in the Silas Little Experimental Forest (SLEF) in the Pine Barrens of New Jersey as a part of a long-term provenance study. Dendroecological analyses of these sources, derived from Maine to Georgia, are being used to help develop tools for the selection and management of future forests. Surprisingly, we found that even widely-spaced plantation trees have locally absent rings. Many individual trees are missing at least four of the expected 35 rings (11% of their annual increment) with some seed sources missing the 1992 ring in 56–96% of all trees. There appears to be a geographical threshold in regards to missing rings among the 27 seed sources. Local seed sources,  $\leq 30$  km from the SLEF, were less apt to have locally absent rings, where only 6.16–8.71% of rings from 1990–2009 were missing. The percentage of missing rings from more distant seed sources (70–990 km away from SLEF) ranged from 8.25 to 20.65%. Subsequent analysis of native *Pinus rigida* indicated missing rings decreased with stem height. Preliminary analysis uncovers differences in latewood and ring width production with some northern populations producing less than southern populations.

Mon-AM1-A-3

## **An Epic Pluvial in the Northeastern US and Potential Ecological Implications**

**Neil Pederson** (Tree-Ring Lab of Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY; [adk@ldeo.columbia.edu](mailto:adk@ldeo.columbia.edu))

Natural disturbance regimes in forests of the northeastern US are typically characterized by frequent, small-scale gaps dynamics, windstorms originating from the continental US and the Atlantic Ocean basin, small-scale fire in a few ecosystems that are embedded within a matrix dominated by broadleaf, deciduous tree species. In fact, fires in the northeastern US are thought to occur so infrequently in some forests types that they have been nicknamed the "asbestos forest". Based upon these disturbance regimes, therefore, it is yet unclear how these forests will abruptly change to a forest type more typical of the mid-Atlantic region as forecast by vegetation models. However, it might be that many of the studies of forest ecology over the last 50 years are biased by the climate during these investigations. Using nested, tree-ring based reconstruction techniques, 31 chronologies comprised of 12 species were used to reconstruct 59.1% of the annual average May–Aug Palmer Drought Severity Index from 1895–2006 in the Hudson River Valley of New York State. The strong reconstruction of observed climate could be the result of the use of multiple species, including non-traditional species such as *Liriodendron tulipifera*, *Betula lenta*, and *Carya* spp. When all records are used to reconstruct May–Aug drought back to 1531, I see that, while the mid-1960s drought is still the most intense drought of the last five centuries, it is closely rivaled by multi-annual droughts centered on a 23-year drought centered on 1566, 7-year drought centered on 1634, and 7-year drought centered on 1665. Just as important, the new reconstruction indicates that the era since the 1960s drought is one of the wettest going back to 1531. In light of these findings, it is apparent that the limited observations between drought and disturbance over the last 50 years in the northeastern US, so often observed in other regions of the world, might mask the fact that climate can be an important driver and shaper of long-term forest development. Old, extant forests developed under a significantly different climate than the one in which many studies have been conducted.

Mon-PM1-D-3

## **A Report on the 19-year Effort to Establish the American Burying Beetle (*Nicrophorus americanus* Olivier) to Nantucket Island, Massachusetts**

**Lou Perrotti** (Roger Williams Park Zoo, Providence, RI; lperrotti@rwpzoo.org) and **Andrew McKenna Foster** (Maria Mitchell Association, amckennafoster@mmo.org)

The American Burying Beetle (*Nicrophorus americanus* Olivier) is a federally listed endangered species once common throughout the eastern and mid-western United States and now surviving in limited habitats in seven states. From 1994–2012, an initiative to re-establish the beetle on Nantucket Island, MA has been carried out by a partnership of public and private conservation agencies. During the 19-year period, nearly 3000 beetles were released at two sites on the 31,000-acre island. This presentation will outline this 19-year effort and show how current post-release monitoring has confirmed that substantial numbers of beetles are reproducing and surviving over winter.

Sun-AM1-B-1

## **Exploratory Analysis of Marine Fish Distributions in the New York Bight from a 1984–1986 Dataset**

**Joseph W. Rachlin** (Lehman College, Bronx, NY; joseph.rachlin@lehman.cuny.edu) and **Barbara E. Warkentine** (SUNY Maritime College, Bronx, NY, bwarkentine@sunymaritime.edu)

The results of a series of trawl surveys along the 13-m contour of The New York Bight from 1984–1986 formed the data set for this exploratory analysis of marine fish distributions. A total of eight discreet stations from Breezy Point, NY in the north to Absecon Inlet, NJ in the south were surveyed during the months of June 1984, November 1984, April 1985, July 1985, and January 1986, collectively covering the fall, winter, spring, and summer seasons. A total of 39 fish species comprised the data set of this study. Using the multivariate ordination technique of detrended correspondence analysis one can visualize the distribution of stations in “species space” on a seasonal basis. In addition, the data as species presence/absence was subjected to parsimony analysis in which the stations are treated as if they were “taxa” and the presence/absence of the species are treated as if they were “character states” of the “taxa (stations)”. This latter method provides a clear graphical picture of the presence/absence of each species at each station and also the movement of species over the whole sampling area on a seasonal basis. Seventeen species were in the sampled zone in June 1984, and 17 species were also found in the zone in November 1984; however, eight of the species found in June were absent in November. In the following spring, 22 species were collected, but nine present in November were not found in April 1985. Similarly, 23 species were present in July 1985, and 12 that had been previously present were replaced. By January 1986, the community of fish along the 13-m contour was down to 18, representing a loss of five species from the peak of 23 in the previous July, but 21 species previously present were absent from the January collection. These patterns reflect seasonal migrations, as expected, and the parsimony analysis allows for a visualization of the fish community structure by station and season.

Sun-AM2-B-4



## Should Species Distribution Models Account for Spatial Autocorrelation? A Test Across 8000 Years of Climate Change

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The distributions of many organisms are spatially autocorrelated, but it is unclear whether including spatial terms in species distribution models (SDMs) improves projections of species distributions under climate change. We provide one of the first comparative evaluations of the ability of a purely spatial SDM, a purely non-spatial SDM, and a SDM that combines spatial and environmental information to project species distributions across eight millennia of climate change in Eastern North America. To distinguish between the importance of climatic versus spatial explanatory variables we fit three Bayesian SDMs to modern occurrence data for *Fagus* (beech) and *Tsuga* (hemlock), two tree genera whose distributions can be reliably inferred from fossil pollen: a spatially varying intercept model, a non-spatial model with climatic variables, and a spatially varying intercept plus climate model. Using palaeoclimate data with a high temporal resolution, we hindcasted the SDMs in 1000-year time steps for 8000 years, and compared model projections with palynological data for the same periods. For both genera, spatial SDMs provided better fits to the calibration data, more accurate predictions of a hold-out validation dataset of modern trees, and higher variance in current predictions and hindcasted projections than non-spatial SDMs. Performance of non-spatial and spatial SDMs according to the area under the receiver operating curve varied by genus. For both genera, false negative rates between non-spatial and spatial models were similar, but spatial models had lower false positive rates than non-spatial models. The inclusion of computationally demanding spatial random effects in SDMs may be warranted when ecological or evolutionary processes prevent taxa from shifting their distributions or when the cost of false positives is high.

Mon-PM1-D-4

## **Headstarting as a Tool in the Restoration of an Endangered Population of Northern Red-bellied Cooter**

**Jonathan Regosin** (Natural Heritage and Endangered Species Program, MA Division of Fisheries and Wildlife, West Boylston, MA; jonathan.regosin@state.ma.us) and Thomas W. French (MA Division of Fisheries and Wildlife)

The Plymouth, MA population of Northern Red-bellied Cooter (*Pseudemys rubriventris*) was listed as federally endangered in 1980. When listed, the population included fewer than 200 older adult turtles with very little recruitment. Beginning in 1984, the headstart of hatchlings has been one of the management tools used to increase the overall number of turtles, boost the population size in individual ponds, restore populations to ponds in which the species had disappeared, and to introduce the species to nearby ponds with appropriate habitat. Over these 28 years, a total of 3720 hatchlings were kept for headstarting, then 229 died, leaving 3501 (94%) to be raised for about 9 months over the winter by cooperating organizations and released at a significantly larger size in the spring. This process includes covering each nest with a wire mesh cage to protect it from predators, monitoring each nest for emergence, releasing about 75–80% of all hatchlings directly into the pond and distributing the remainder of the hatchlings to cooperating organizations and individuals to raise over the winter. All nests are allowed to incubate under the natural temperature and weather conditions at the pond. The first headstarted female confirmed nesting was a 13 year old found in 2000. Although several instances of adult headstarted females laying eggs have now been discovered and numerous large adult headstarted turtles have been observed, and even captured, at several ponds in which only turtles of headstarted origin occur, the level of success of this project has not been well documented.

Sun-AM1-B-4

## **Timing Treatments to the Phenology of Root Carbohydrate Reserves to Control Invasive Plants**

**Julie Richburg** (The Trustees of Reservations, Holyoke, MA; jrichburg@ttor.org) and **William A. Patterson III** (University of Massachusetts, Amherst, MA; wap@eco.umass.edu)

To maintain or improve many native habitats, land managers need to control invasive plants. Control methods vary depending on the target species' growth form, the extent of the invasion, control resources available, and other species and resources at the site. Mechanical treatment, prescribed fire, hand-pulling, and application of herbicides, alone or in combination, are used for control. Woody invasive plants are often difficult to control due to their ability to sprout from stems, stumps, and roots. Successful control of these species requires understanding the species phenology and temporal variations in their below-ground resources. Total non-structural carbohydrate (TNC) reserves in the roots of woody species support growth following disturbance and generally follow an annual cycle of depletion and replenishment. This study compared the effectiveness of mechanical and prescribed fire treatments when applied during either the dormant or growing seasons. TNC were depleted following all treatments. Dormant-season-treated plants, whether cut or burned, sprouted and replenished their reserves within the following growing season. For growing-season-treated plants TNC remained depleted longer, with a greater effect on plants that received more treatments. For most species studied, TNC recovered to pre-treatment levels by the end of one growing season without treatment. Timing treatments to the cycle of TNC can increase the effectiveness of control methods, although repeated treatments may be necessary for several years. Prescribed fire, although similar in some respects to mechanical treatments, can provide for better restoration of sites invaded by invasive shrubs, particularly in the removal of thatch and the opening up of the shrub layer for native species. In situations where chemical control is not possible, timing treatments to TNC cycles will be key to a successful control program. Alternatively, mechanical methods in conjunction with chemical control may increase the effectiveness of the control by weakening well-established perennials before application of herbicide.

Mon-AM1-D-3

## **New Hampshire Moose**

**Kristine Rines** (New Hampshire Fish and Game Department, New Hampton, NH; Kristine.Rines@wildlife.nh.gov)

The New Hampshire's Moose (*Alces americana*) herd is beginning to exhibit declines in both physical parameters and density that are unrelated to hunting pressure. The author will discuss current status of Moose and suggest reasons for the recent changes based on findings from research conducted in New Hampshire and several other eastern jurisdictions.

Mon-PM2-C-1

## Effect of Elevation on Reproductive Performance in Three Sphagnum Species

**Sean Robinson** (SUNY-Oneonta, Oneonta, NY; sean.robinson@oneonta.edu) and **Elizabeth Castle** (SUNY-Oneonta, Oneonta, NY; castee37@suny.oneonta.edu)

Given the high metabolic cost associated with sexual reproduction, and the harsh conditions of alpine habitats, asexual reproduction is assumed, albeit untested, to be high in alpine plant populations. High rates of asexual reproduction are predicted to result in reduced levels of genetic variation, thereby reducing the adaptability of species over time. Given current concerns about climate change and its possible impact on such environments, alpine plant communities are thought to be at an evolutionary disadvantage. The alpine plant communities of the Adirondack High Peaks harbor a unique assemblage of alpine plant species that are highly disjunct from more extensive populations found to the north and northeast. In order to test the hypothesis that alpine populations exhibit a high degree of asexual reproduction, reproductive performance was assessed in three species of *Sphagnum* (*S. pylaesii*, *S. tenellum*, and *S. fuscum*) that occur on the Adirondack alpine summits. Samples of all three species were collected from a number of high- and low-elevation sites within the Adirondacks. Genotypic diversity in high- and low-elevation populations was inferred from variation at 15 microsatellite loci. In addition, contemporary and historical collections of all three species were examined to look for physical evidence of sexual reproduction (gametangia and sporophyte production). Levels of genetic variability were much lower in alpine populations of all three species compared to low-elevation populations. Physical dissection of collected material found significantly fewer gametangia/ less sporophyte production in summit collections compared to collections from low elevations. Together, these results suggest high rates of asexual reproduction are occurring in alpine populations. Further analyses are being conducted on other alpine bryophyte and vascular plant species in order to determine the extent of asexual reproduction in, and possible genetic isolation of, these unique plant populations.

Mon-AM2-A-2

## Assessing the Sensitivity of Migratory Songbirds to Climate Change

**Nicholas L. Rodenhouse** (Wellesley College, Wellesley, MA; nrodenho@wellesley.edu)

Understanding sensitivity to climate conditions is key to projecting the effects of climate change on animal populations; however, it is not clear how climate sensitivity is best measured and assessed. No single measure captures either the complexity of climate or the avian responses to it. Here we report the sensitivity of a migratory songbird to climate differences by using multiple measures of climate, habitat quality, and avian demographic responses. We documented the demography and habitat quality (abundance of food and nest predators, vegetation structure) of Black-throated Blue Warblers (*Setophaga caerulescens*) for a period of 15 years over a 600-m elevation gradient within northern hardwoods forest. This gradient spanned approximately 2.3 °C in mean annual temperature and 1.8 cm in annual precipitation and occurred over 250–850 m asl in the Hubbard Brook Experimental Forest, NH. Measures of both habitat quality and demographic rates were highly sensitive to climate differences. Where climate was warmer (low elevation), breeding pairs encountered less food and more nest predators in a more heterogeneous habitat. In response to these differences in habitat quality, recruiting individuals settled as high along the elevation gradient as was allowed by weather conditions during arrival in May. Annual fecundity and adult survival probabilities were greatest at cooler mid- and high elevations. These findings suggest that even small amounts of climate change, e.g., that associated with 1 °C of warming, will reduce habitat quality and lower demographic rates for migratory songbirds.

Mon-PM2-D-4

## **Bee Diversity, Distribution, and Monitoring in Boston Harbor Islands National Park Area**

**Jessica J. Rykken** (Harvard University, Cambridge, MA; [jrykken@oeb.harvard.edu](mailto:jrykken@oeb.harvard.edu))

Between 2005 and 2010, we surveyed bees on 18 islands in Boston Harbor Islands National Park area as part of an All Taxa Biodiversity Inventory (ATBI). The primary scientific objective of the ATBI was to document the diversity and distribution of arthropods across selected islands in the Park. A secondary goal was to assess if diversity patterns conformed to classical predictions of the theory of island biogeography (i.e., larger islands have more species, and more isolated islands have fewer species). Bees were collected with nets and transects of “bee bowls.” In all, we documented 179 species of bees, including seven non-natives. Species richness was positively correlated with island area, but showed no relationship to island isolation. Community similarity between pairs of islands also showed no relationship to the distance between islands, suggesting that inter-island and island-mainland distances do not present significant barriers to dispersal for most bees. Within the framework of the ATBI, we also piloted a bee monitoring program. Because bees are diverse and abundant, easy to sample, relatively well-known taxonomically, and closely tied to their plant hosts, they may serve as effective indicators of change in ecosystems vulnerable to effects from climate change. Our main objective was to get baseline knowledge of bee abundance and diversity on nine islands, using a sampling design with adequate statistical power to detect relatively small changes in these metrics over multi-year intervals. In 2010, we collected and identified 3932 bees, comprising 100 species. More than 20 volunteers and park staff assisted in the field and/or in the lab to document bee diversity for this effort. As a complement to our scientific objectives, we have also produced several educational tools to educate visitors and volunteers about bee diversity in the Park, including bee posters and a field guide to bee genera.

Mon-PM2-A-2

## **Mercury Bioaccumulation within Terrestrial Foodwebs in the Adirondack Park of New York State**

**Amy K. Sauer** (BioDiversity Research Institute, Gorham, ME and Syracuse University, Syracuse, NY; [amy.sauer@briloon.org](mailto:amy.sauer@briloon.org)), **Charles Driscoll** (Syracuse University, Syracuse, NY, [ctdrisco@syr.edu](mailto:ctdrisco@syr.edu)), **David Evers** (BioDiversity Research Institute, Gorham, ME, [david.evers@briloon.org](mailto:david.evers@briloon.org)), **Melissa Duron** (BioDiversity Research Institute, Gorham, ME, [melissa.duron@briloon.org](mailto:melissa.duron@briloon.org)), **Evan Adams** (BioDiversity Research Institute, Gorham, ME, [evan.adams@briloon.org](mailto:evan.adams@briloon.org)), **Carrie Osborne** (BioDiversity Research Institute, Gorham, ME, [carrie.osborne@briloon.org](mailto:carrie.osborne@briloon.org)), and **Allyson Jackson** (BioDiversity Research Institute, Gorham, ME, [allyson.jackson@briloon.org](mailto:allyson.jackson@briloon.org))

A potent neurotoxin, mercury has been shown to impact the behavior, growth, and reproductive success of wildlife through bioaccumulation within foodwebs. The detrimental effects of mercury contamination have been extensively documented in aquatic ecosystems, but it is equally important to understand the impacts that mercury deposition may have on biota within the adjacent, surrounding landscape. Relatively few studies have focused on the mechanisms of mercury bioaccumulation in terrestrial ecosystems. From 2008–2011, intensive field studies were conducted at several Adirondack northern hardwood forest, montane forest, and *Sphagnum* bog habitats to trace the movement of mercury through sensitive terrestrial foodwebs using songbird species as biological indicators for ecological health.

Sun-PM1-A-3

## **Common Loons in the Northeast: Natural History and Conservation Threats**

**Nina Schoch** (Biodiversity Research Institute's Adirondack Center for Loon Conservation, Ray Brook, NY; nina.schoch@briloon.org) and **Amy Sauer** (Biodiversity Research Institute's Adirondack Center for Loon Conservation, Ray Brook, NY; amy.sauer@briloon.org)

*Gavia immer* (Common Loon) is a unique fish-eating predator at the top of the aquatic food web. This captivating species is extremely specialized for living in aquatic habitats, with a stream-lined body, dense bones, and flattened legs. Loons live 20–30 years and are territorial, coming back to the same lake and territory each breeding season. They nest in early summer and can raise 1–2 chicks annually. Many anthropogenic threats have potential to impact Loon populations and their habitats in the Northeast. Conservation concerns for breeding Loons include such factors as airborne pollutants (e.g., mercury and acid deposition), recreational disturbance, shoreline development, lead toxicity due to ingestion of lead fishing tackle, and entanglement in fishing line. During their migration and on their wintering areas on the coast, Loons face such threats as botulism outbreaks, oil spills, and entanglement in commercial fishing nets.

Sun-PM1-A-5

## **Climate-induced Phenological Asynchrony between Forest Tent Caterpillars and their Hosts Trees**

**Ezra Schwartzberg** (University of Wisconsin - Madison, Adirondack Research, Inc., Madison, WI; eschwartzberg@adkres.com), **Kenneth F. Raffa** (University of Wisconsin- Madison), **Mary Jamieson** (University of Wisconsin- Madison), **Richard L. Lindroth** (University of Wisconsin- Madison), and **Peter B. Reich** (University of Minnesota, Saint Paul, MN)

As global temperatures increase, we expect insect and plant phenological events to advance; however the rate in which they advance in relation to each other is unclear. For Forest Tent Caterpillars (*Malacosoma disstria*), phenological synchrony between egg hatch and host plant bud-break plays a critical role in insect survival and population dynamics. Using a boreal forest warming infrastructure in northern Minnesota (B4Warmed), we were able to simulate future temperatures by warming small outdoor forest plots by 1.8 and 3.6 degrees celsius. We recorded phenology, leaf chemistry, temperature accumulation, and insect performance to make inferences of insect-plant interactions in a warmer future world. We found that increased temperature resulted in increased development rates for both insects and their host trees. However, insects differed in their rate of increase compared to their host plants, aspen and birch, indicating an altered phenological synchrony under warmer conditions. Temperature also affected leaf condensed tannin levels, with lower levels in heated plots. These results show that predicted increases in global temperature will result in altered chemical and phenological interactions between this important forest pest and its host plants.

Sun-PM1-A-4

## **The "OutSmart Invasive Species" Invasive Species Early Detection System and Related Research Studies**

**Charlie Schweik** (Center for Public Policy and Administration and Department of Environmental Conservation, UMass Amherst; [cschweik@pubpol.umass.edu](mailto:cschweik@pubpol.umass.edu)), Jared Starr (Department of Environmental Conservation, UMass Amherst), Nathan Bush (Department of Environmental Conservation, UMass Amherst), Lena Fletcher (Department of Environmental Conservation, UMass Amherst), Jennifer Fish (Massachusetts Dept of Conservation and Recreation), and Jack Finn (Department of Environmental Conservation, UMass Amherst)

Government agencies and nonprofit stewardship groups working to control the spread of invasive plant species often work to train citizens in non-native plant identification. While this is an extremely valuable and important endeavor, scaling-up this type of training requires significant time and resources. With the rapid growth and increasing popularity of smartphone technology, there is a real potential to develop "electronic field guides" to help train citizens who cannot participate in in-person plant-id seminars. This presentation will introduce the Outsmart Invasive Species Smartphone application (app), which allows users to access text, image, and video information about invasive species instantly on their smartphone, and enables them to report sightings of early detection species to the web-based EDDMapS database managed at the University of Georgia's Center for Invasive Species and Ecosystem Health. We will also describe two studies we are conducting over the 2012 and 2013 field seasons in Massachusetts. The first study relates to citizen participation and their incentives and investigates what we call the "Theory of Compound Incentives". This theory hypothesizes that citizens will contribute more data if they have multiple motivations to do so. The second study investigates citizen invasive plant sightings and data quality. Here we are examining how well video-based plant-id training embedded on the smartphone does in terms of data quality compared to traditional in-person plant-id training. Both of these studies are still being investigated in this coming field season, but we will report our preliminary findings from 2012.

Sun-PM1-B-3

## **Emerald Ash Borer: Biology, Spread and Detection Efforts in the Northeast**

**Nathan W. Siegert** (US Forest Service, Northeastern Area State & Private Forestry, Forest Health Protection, Durham, NH; [nwsiegert@fs.fed.us](mailto:nwsiegert@fs.fed.us))

*Agrilus planipennis* (Emerald Ash Borer), a non-native wood-boring beetle that feeds on *Fraxinus* spp. (ash trees), was discovered to be responsible for widespread decline and mortality of ash in the greater Detroit metropolitan area in 2002. Isolated, satellite populations of Emerald Ash Borer have recently been detected in the Northeast. Specifically, Emerald Ash Borer infestations were detected in the Hudson River Valley of New York in 2010 and in New Haven County in southwestern Connecticut and Berkshire County in western Massachusetts in 2012. In addition to an overview of Emerald Ash Borer biology and its current status in New York and New England, state and federal detection efforts and results of recent delimitation surveys to determine the extent of these infestations will be discussed.

Mon-PM1-B-1

## **Assessing the Nutritional Impact of Invasive Fruits on Migrating Songbirds**

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Migrating songbirds in the Northeast rely heavily on fruit resources during autumn stopovers. The presence of invasive fruit-bearing shrubs in habitats at important stopover sites may affect the quality of food resources available for refueling birds. Nutritional analysis of the fruits of locally occurring shrub species near the south shore of Lake Ontario revealed that invasive fruits are lower in energy density and fat content than native fruits in this area, suggesting that invasive fruits may negatively impact migrating birds that consume them during refueling periods. Analysis of refueling rates of migrating passerines via plasma metabolite profiling supports this conclusion because birds had lower plasma triglyceride in habitat dominated by high-quality native fruits versus habitat with lower quality and less abundant fruit. In addition, an improved method for the analysis of the phenolic content of the fruits was investigated, along with the total antioxidant capacity of fruits. In conjunction with these methods, multidimensional fluorescence spectroscopy with chemometric analysis has been investigated as a novel tool for characterizing fluorophoric nutritional components of native and invasive fruits.

Sun-AM2-D-3

## **Pilot Studies on Amphibians, Reptiles, and Insects have Metamorphosed into Important Long-term Data Sets for MA and NH**

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I will report on a collaborative project including various institutions, students, and volunteers from Massachusetts and New Hampshire to collect data on ectothermic animals and provide educational and training opportunities. We have developed standardized sampling techniques that can be implemented by seasonal students, interns, and volunteers, including building a reference collection of insects and other invertebrates. The selection of our study locations was dictated in part by the pool of person-power and biogeographical locations. We now have 5 years of data on amphibian breeding from the alpine ponds of the White Mountains, NH; 10 years from Wachusett Mountain, MA; 5 years of snake community data from two islands in Nantucket County and Wachusett Mountain, MA; and 5 years of data collection on forest insects from Wachusett Mountain, White Mountains, and Nantucket County. We are also working on establishing a breeding colony of *Thamnophis sirtalis* (Garter Snakes) at Bristol County Agricultural High School. It is essential to have a core group of leaders with patience and enthusiasm to encourage a rotating pool of entry-level field assistants. Concentrating field assistant's work to projects limited to a 3-month summer period June–August is helpful to both project planning and setting expectations and responsibilities. A regimen of standardized field data collection, repeated throughout the project, teach valuable skills on reliability, observation, and data organization. Responsibilities for field assistants should also include data analysis and interpretation for both their training and relief to supervisory biologists.

Mon-AM2-C-1



## **Movement Patterns of Anadromous Brook Trout (*Salvelinus fontinalis*) in a Restored Coastal Stream in Southern Massachusetts**

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We sought to describe movement patterns of Brook Trout in a small coastal system, Red Brook, following dam removal and stream restoration. Specifically, we wanted to identify patterns of movement between the stream, estuary, and bay. Between June 2010 and May 2012, we surgically implanted 85 Brook Trout (167–312 mm FL) with acoustic transmitters. To monitor movement, we deployed 16 stationary acoustic receivers: 4 in Red Brook, 4 in the estuary, and 8 in the bay. Preliminary data reveal that 31 tagged fish have traveled into the estuary and 7 have been detected in the bay. At least one individual was detected back in Red Brook after residing in the bay between November 2010 and January 2011. Using data from temperature and conductivity loggers deployed with the receivers, as well as tidal current data, we will present an analysis of factors that could be influencing the movement patterns of Brook Trout in the Red Brook system.

Sun-PM1-D-2

## **Historical Factors Affecting Secondary Succession at Mohonk Preserve**

**Emily W.B. (Russell) Southgate** (Hood College, Frederick, MD; [ewbsouthgate@gmail.com](mailto:ewbsouthgate@gmail.com))

Historical records and pollen records agree that *Quercus* spp. (oaks) were the most abundant trees in the precolonial forests of the Hudson Valley, accompanied by *Carya* spp. (hickories) and *Castanea dentata* (American Chestnut). *Acer* spp. (maples), *Fagus grandifolia* (American Beech), and other tree species were much less common. Over the last century, many agricultural fields that were established after these forests were cut down have been abandoned and have grown back to forest. These fields have not, however, been abandoned all at once, but rather at various times. Mohonk Preserve's Foothills includes secondary forest stands ranging in age from 100 to about 30 yrs old. Stands on similar substrates and soils differ not only in age, but also in the conditions that existed at the time of field abandonment and treatment since abandonment. This study analyzed the structure of 8 stands of various ages, to compare their composition and to evaluate the possible importance of specific differences in initial conditions. Five of these were on well-drained soils on similar substrates and are discussed here. *Quercus alba* (White Oak) is the major canopy tree in only the oldest of these stands, established about 100 years ago. A slightly younger stand on a substrate that includes more acidic glacial till than the others includes a high diversity of canopy trees. However, *Acer saccharum* (Sugar Maple) trees dominate the canopies of all of these stands except for the oldest one, and the reproduction of all five. This raises two questions: first, why was White Oak not the first dominant hardwood in the 4 younger stands, and, second, why does Sugar Maple dominate the understory and canopy of these stands? Fire does not appear to be a factor, as it is unlikely that it was common at the oldest stand. A combination of seed sources and deer browse, however, seem to be major contributing factors to the current canopy composition and regeneration of these stands. From the stand structure, it appears that these forests represent a novel, alternative stable state for the secondary forests of this region.

Mon-PM1-D-2

## **Muskrat Preferences between Common Reed and Native Cattail for Lodge Construction and Location in a New York State Marsh.**

**Tamathy Stage** (Antioch University New England, Keene, NH; [tstage@antioch.edu](mailto:tstage@antioch.edu))

The Muskrat (*Ondatra zibethicus*) is an ecological engineer, ranging from minor disturbances to the devastating eat-out of a marsh. Its adaptability and high fecundity have kept this species fairly common, despite massive habitat loss and marginalization. Although much research concerning the rodent was conducted in the middle 20th century, little attention has been paid to how it is coping with landscape and environmental change over the past decades. Not only are a fraction of original wetlands remaining, many of the flora are being replaced by invasive exotic species. The Common Reed (*Phragmites* sp.) in eastern wetlands of North America, for example, is an invasive species formed when a close relative to the native salt-water variety arrived, hybridized and expanded into many freshwater wetlands, displacing native cattails and other marsh plants. How Muskrats are affected by these changes has yet to be determined. They rely heavily on wetland plants, particularly cattails, for food and lodge construction. Although muskrats will use whatever materials are available, some plants are better suited for building and forage. The Common Reed is a much weaker plant than cattails, and its nutritional value has yet to be determined. In this study, I examined whether Muskrats use common reed as a building material and if plant species will influence where Muskrats build lodges. The study was conducted in the Sandhill Crane Unit of the Montezuma National Wildlife refuge in Savanna, NY during the summer of 2011. I looked at which plants Muskrats were using for construction and at the vegetation surrounding lodges and compared that to 78 randomly generated points. Lodge materials data show that cattails are strongly preferred as a building material over other available plants. Results from the plant surveys imply that Muskrats are harvesting cattails at a greater rate than the Common Reed. Distribution of the lodges showed that Muskrats most preferred dense, pure stands of cattails. Should the Common Reed overwhelm this marsh as it has others, it may trigger greater dispersal by Muskrats away from the marsh in search of more ideal vegetation patterns.

Mon-PM1-C-2

## Conservation of the Timber Rattlesnake (*Crotalus horridus*) in New England

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Species conservation across multiple states poses many challenges. The Timber Rattlesnake (*Crotalus horridus*) is threatened throughout much of its range, and reaches the northeastern boundary in New England. In these areas, populations are fragmented and isolated, with many populations having been extirpated in the past century. Surveys suggest numbers are declining in many of these populations, resulting from habitat loss, poaching, and disease. Here, we use a combination of genetic analyses and radiotelemetry studies to approach these issues from a regional aspect. Genetic structure was assessed using 15 microsatellite loci, and tissue samples collected from 200 individuals across all New England populations. Preliminary results indicate that geographic distance is a poor predictor of genetic distance between dens and populations, both between and within sites. Telemetry results within one metapopulation have provided an initial mechanistic explanation for genetic structure, but our understanding of between-site variation is hampered by poor knowledge of historical events leading to population isolation. Observations of Timber Rattlesnakes with facial lesions are also increasing, and are reported throughout New England. Ongoing health surveys, including biopsies of afflicted individuals, suggest one common fungal species, but more sampling is needed before results are definitive. We will continue to gather data on genetic diversity, movements, disease presence, and habitat selection over the next 2–3 years to better describe and understand connectivity of Timber Rattlesnake populations near the species' distributional limit. This regional research represents a collaboration among many state agencies, universities, zoos, environmental consulting agencies, and non-profit organizations. Without these collaborative research efforts, region-wide species conservation would not be possible.

Sun-AM1-C-3

## Use of an Assessment of Climate Change Impacts on Shorebird Habitat to Manage Wetlands and Identify No Regrets Actions

**Dorie Stolley** (Goldenrod Foundation/Three Birds Consulting, Plymouth, MA; [dorie.stolley@goldenrod.org](mailto:dorie.stolley@goldenrod.org))

The development of a decision-making tool—The Climate Change Vulnerability Assessment for Shorebird Habitat (CCVASH)—assists coastal shorebird site managers in prioritizing habitat for management activities, collaborating with partners for shorebird conservation and identifying *no regrets actions* in the face of uncertainty over climate change forecasts and impacts. By comparing the relative value and vulnerability of different types of wetland habitats in a transparent and replicable manner, managers are able to decide where to invest their limited funding and resources. Additionally, the CCVASH provides a framework for designing strategies to increase habitat and species resilience to climate change and a method of assessing the likelihood of success of each strategy. Use of the assessment tool at three Western Hemisphere Shorebird Reserve Network sites at national wildlife refuges on the East Coast demonstrated that there are actions, some site-specific and others common across location, that will increase shorebird success regardless of the extent of climate change and associated effects on habitat. These *no regrets actions* include:

- controlling human disturbance,
- reducing predation/predators,
- training staff in oil spill response,
- working with local entities to ensure sediment availability by preventing shoreline hardening, and
- using dredge material to create or fortify islands and barrier beaches.

Climate change adds a significant additional stressor that increases the importance of these management actions. The assessment process demonstrates the importance of using the best available science, collaboration, and site-specific actions to maximize the quality and quantity of available habitat for shorebirds.

Mon-PM2-D-2

## Implications of Reduced Winter Snowfall for Wintergreen Ferns

**Jack T. Tessier** (SUNY Delhi, Delhi, NY; [tessiejt@delhi.edu](mailto:tessiejt@delhi.edu))

Anthropogenic climate change is resulting in winters with less snow than is historically typical. This deficit may have an impact on wintergreen ferns whose fronds lay prostrate under and protected from frost by the snow pack. I collected demographic data regarding the wintergreen fern community at four forested sites near Delhi, NY (*Dryopteris intermedia*, *D. marginalis*, and *Polystichum acrostichoides*) and its ecophysiological traits at one of those sites surrounding the winter of 2012, which had very little snowfall. *Dryopteris intermedia* was the most common fern and it had the highest percentage of frost damaged fronds and the highest percentage of its cover damaged. *Polystichum acrostichoides* had the highest vernal photosynthetic rate in its undamaged fronds, and all three species had a negative net photosynthetic rate in frost-damaged fronds. The wintergreen fern community lost  $39.69 \pm 2.80\%$  of its photosynthetic surface area and  $46.72 \pm 3.21\%$  of its vernal productivity to frost damage. *Dryopteris intermedia* had the thinnest leaves, and this trait may have made it the most susceptible to frost damage. *Dryopteris intermedia* cover decreased significantly at one site, but no other significant changes in cover were present among the three species and four sites. Across sites, all species trended downward in cover, but none of those changes was statistically significant. These results demonstrate that species will respond to a reduced snowpack on an individual basis, and repeated winters of little snow may decrease the abundance of wintergreen fern species.

Mon-AM2-A-3

## **Do Temperate Deciduous Forests Experience Synchronous Disturbances?**

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It has been suggested that canopy persistence might slow the effects of anthropogenic climate change in the forests of eastern North America (ENA). Forests currently experiencing dramatic changes in structure and function are generally found in semi-arid regions or have low species diversity when compared to the temperate deciduous forests of ENA. The goal of this study was to see if there existed synchronous disturbances through time, which could cause a more rapid change in forest composition than the effects of gap dynamics alone. For this experiment, we randomly selected plots in the Palmaghatt Ravine, a forest considered to be old growth, prior to going in the field. Plots were each composed of nested circles, so that the size of trees cored increased with distance to capture more of the larger and, presumably, older trees to construct a longer forest history. Trees were cross-dated within species, to ensure correct dating, measured to the nearest micron, and then analyzed to determine growth releases and recruitment. From this data, we reconstructed the disturbance history across a 1-km transect of the Palmaghatt Ravine. The 1870s experienced a strong disturbance event that we have had recently confirmed as logging. This came as a surprise as it was presumed to be an old-growth forest. Discounting the 1870s logging event, we see other synchronous disturbances across these plots in the 1790s, 1850s, 1940s, and early 1970s, which suggests that these forests have been influenced for centuries by severe disturbance as well as by gap dynamics. Overall, we found that release events are nearly continuous through time, but also contain pulses of disturbance, not all of which can be easily identified as anthropogenic in cause. Thus, this pilot study indicates that there are pulses in forest dynamics in these gap-dynamic-dominated forests. We interpret these results as indicating that these intense and synchronous events could allow for more rapid changes in the forest than simply gap dynamics.

Mon-AM1-A-1

## **Metapopulation Dynamics of Pool-Breeding Amphibians: The Marbled Salamander (*Ambystoma opacum*) in Western Massachusetts**

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Pool-breeding amphibian populations operate at multiple spatial scales, from the individual pool to surrounding upland habitat to clusters of pools. When metapopulation dynamics play a role in long-term viability, conservation efforts limited to the protection of individual pools or even pools with associated upland habitat may be ineffective over the long-term if connectivity among pools is not maintained. In this presentation, we will discuss the results of a 10-year landscape-level study of a Marbled Salamander (*Ambystoma opacum*) metapopulation distributed among 14 seasonal pools in western Massachusetts. In addition to presenting direct results of this study, we will highlight the importance of applying conservation strategies beyond the scale of individual breeding wetlands and their surrounding uplands for the effective long-term conservation of pool-breeding amphibians.

Sun-AM1-C-1

## **Searching for the Nereids in the Bay of Boiling Waters, Cobscook Bay, Maine**

**Thomas J. Trott** (Suffolk University, Boston, MA; ttrott@suffolk.edu)

The complex and convoluted coastline of the Gulf of Maine has been shaped by periods of glaciations and sea-level changes, and is heavily influenced by oceanographic and atmospheric elements from the Gulf of Maine. These driving factors are largely responsible for creating diverse nearshore habitats and their equally diverse communities. Cobscook Bay, ME is exceptional because of the extreme tidal range that characterizes this macrotidal estuary and creates an ecosystem with biodiversity unsurpassed at lower latitudes. Over 600 publications either refer to the Bay or are the products of studies about the Bay. From 1843 to 2013, a total of 80 publications with marine, zoological, and taxonomic importance appeared in the literature, of which roughly 42 were monographs. In sub-tidal and intertidal habitats, 780 species of marine invertebrates have been found. When considering major taxa only, i.e., Porifera, Cnidaria, Annelida, Arthropoda, Mollusca, and Echinodermata, a total of 666 species have been recorded. Of these, 42% ( $n = 281$ ) have been seen only once, and 21% ( $n = 140$ ) have not been seen since 1900. Though the frequency of taxonomic publications is unevenly distributed, with more than half appearing by the turn of the 19<sup>th</sup> century, this effort is offset by the considerable focus from ecological impact studies during the 1970s and 1980s. Changes in species diversity within the bay during the 20<sup>th</sup> century are unmistakable, while locations lying just outside the bay remain unchanged from historical baselines. This difference is statistically significant based on several lines of evidence. While factors contributing to species loss prior to the turn of the 19<sup>th</sup> century are inexplicable, the current measurable changes in diversity points to the exploitation of commercially valuable species as a cause. Combined with the emergence of markets for new species, commercial harvests will continue to degrade the biodiversity of an ecosystem still considered by some to be the jewel in the crown of biodiversity of the Gulf of Maine.

Sun-AM2-B-5

## **Effect of Hemlock Adelgid on New England Arthropod Biodiversity**

**R. Talbot Trotter III** (USDA Forest Service, Hamden, CT; rtrotter@fs.fed.us)

Invasive herbivorous species can alter the structure of forested systems both directly, through the reduction or elimination of host plants, and indirectly, by changing host quality and condition. Here information is presented on the impact the invasive Hemlock Woolly Adelgid (*Adelges tsugae*) can have on the biodiversity and community structure of arthropods at tree, stand, and landscape scales in New England. Generally, more than 600 species of arthropods are found in association with the canopies of Eastern Hemlock in the northeast, along with the approximately 400 species found on White Pine in the same stands. Species known to be associated with Eastern Hemlock, but not known to be associated with White Pine represent a portion of biodiversity threatened by the removal of Eastern Hemlock from eastern stands. The relative sensitivity of the system to biodiversity loss is heavily scale-dependent, with the system suggesting some resilience at larger landscape scales, however, at threshold sizes species may be rapidly lost.

Sun-AM2-A-5

## **Short-Term Movement Patterns of Striped Bass (*Morone saxatilis*) Quantified Using Tri-axial Accelerometers in a Massachusetts Coastal Bay**

**Heather Tyrrell** (University of Massachusetts Amherst, Amherst, MA; htyrrell@cns.umass.edu), Stephen McCormick (USGS, Conte Anadromous Fish Research Center, MA; mccormick@umext.umass.edu), Jeffrey Kneebone (SMASST University of Massachusetts Dartmouth, MA; jkneebone@umassd.edu), Gregory Skomal (MA Marine Fisheries, MA; Gregory.Skomal@state.ma.us), and Andy Danylchuk (University of Massachusetts Amherst, Amherst, MA; danylchuk@eco.umass.edu)

Striped Bass (*Morone saxatilis*) are highly targeted by recreational anglers along the Atlantic coastline and are an important source of revenue for the sport fishing industry. Although there is a good understanding of their seasonal migration patterns, less is known about the short-term movements of Striped Bass once they have reached coastal embayments frequented during the summer months. Between June and October 2011, we used a fixed acoustic receiver array ( $n = 33$  receivers) deployed in Plymouth/Kingston/Duxbury (PKD) Bay, Massachusetts to quantify short-term movement and activity patterns of Striped Bass. Thirty-four Striped Bass (38.5–80.5 cm TL) caught with hook and line were surgically implanted with acoustic tri-axial acceleration transmitters at three discrete sampling periods (early June, late July, and early September). Of the 34 Striped Bass tagged, 32 were heard regularly in PKD Bay following release, generating over 70,000 reliable detections. Preliminary assessment of movement patterns show relatively low activity levels and site fidelity for most of the season, plus insight into daily tidal movements and feeding behavior. This study is one of the first to use accelerometers to quantify the activity levels in Striped Bass, a tool that might prove useful for also understanding impacts related to catch-and-release angling.

Sun-PM1-D-4

## **Linking Land Cover and Migratory Waterfowl: A Case Study in Northeastern New York**

**Jessica Van Splinter** (SUNY Plattsburgh, Plattsburgh, NY; jvans001@mail.plattsburgh.edu), Jacob Straub (SUNY Plattsburgh, Plattsburgh, NY; jstra009@plattsburgh.edu), and Eileen Allen (SUNY Plattsburgh, Plattsburgh, NY; Eileen.allen@plattsburgh.edu)

Literature shows Atlantic Flyway populations of migratory waterfowl, *Branta canadensis* (Canada Geese) and *Chen caerulescens* (Snow Geese), have shifted their migration patterns westward since the 1980s to include Northeastern New York. Anecdotal evidence suggests that these species have increased their utilization of Krystal Lake, a 9.7-ha abandoned limestone quarry in Chazy, NY, in the past 5 to 10 years. Prior studies examining geese distribution and abundance have shown them to correlate with cropland size and type. We attempted to substantiate stakeholder reports of increasing migratory use by analyzing historical land-cover data for resource changes, particularly in agricultural cover types. We used National Land Cover Database (NLCD) datasets (1992 to 2006) and Cornell University Geospatial Information Repository (CUGIR) New York Cropland Data Layers (2002 to 2010) in a 16.1-km radius surrounding Krystal Lake (81,325-ha study area) to determine hectares of change in agricultural and hydrologic components over this time period. Both CUGIR and NLCD showed a decrease in overall agricultural land-cover (CUGIR: 6052 ha decrease; NLCD: 3266 ha decrease). CUGIR data reveals that while agricultural cover decreased, an increase in corn (3151 ha increase), alfalfa (3279 ha increase), and other hay cover (3666 ha increase), agricultural crops routinely utilized by migratory geese, occurred during this time period. Both the CUGIR and NLCD data sets also depict increasing wetland cover within the study area (CUGIR: 11,904 ha increase; NLCD: 5249 ha increase). These findings add credence to anecdotal reports of increasing migratory geese populations at Krystal Lake. Increasing waterfowl presence, leading to a large influx of fecal material, has the capacity to alter aquatic geochemistry. Nutrient loading through fecal material may modify ecosystem function, creating algal blooms and eutrophication, the effects of which are still unknown in Krystal Lake.

Sun-AM2-D-2

## **The Post-fledging Ecology of Mature Forest Songbirds in a Managed Forest Landscape**

**Andrew Vitz**, (Massachusetts Division of Fisheries and Wildlife, West Boylston, MA; [andrew.vitz@state.ma.us](mailto:andrew.vitz@state.ma.us)) and Amanda D. Rodewald (Cornell Lab of Ornithology, Ithaca, NY)

For Neotropical migratory passerines, the post-fledging period begins with young fledging from the nest and extends until the onset of fall migration and is one of the least known periods of the avian life cycle. Fledgling mortality is generally very high and habitat use can differ from those used for breeding. We radio-tagged 51 Ovenbird (*Seiurus aurocapillus*) and 60 Worm-eating Warbler (*Helmitheros vermivorum*) fledglings and 85 independent juvenile Ovenbirds. All radio-tagged birds were tracked daily, GPS (global positioning systems) coordinates were collected, and habitat features were compared between actual fledgling and random locations. We generated estimates of post-fledging survivorship while evaluating the influence of biological covariates using known fate models in program MARK. Fledgling Ovenbirds and Worm-eating Warblers and independent juvenile Ovenbirds all demonstrated selection of habitats characterized by dense understory vegetation. We generated post-fledging survival rates of 65% and 67% for fledgling Ovenbirds and Worm-eating Warblers and 83% for independent juvenile Ovenbirds. Our results suggest that dense understory vegetation is a critical feature defining suitable post-fledging habitat. Although riparian thickets and tree-fall gaps within some forests may provide abundant post-fledging habitat, others may lack the characteristics necessary to maximize fledgling survival.

Sun-AM1-D-4



## Conservation Education: Teaching, Learning, and Assessment with NCEP Modules

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The Network of Conservation Educators and Practitioners (NCEP) offers free conservation teaching modules ([www.ncep.amnh.org](http://www.ncep.amnh.org)) on nearly 100 topics. Each module includes a synthesis of the background and associated teaching materials readily adaptable to a variety of classroom instructional uses from advanced high school to graduate studies. This study examined how well undergraduate students can develop data analysis skills relevant to conservation biology learned in a one-semester college laboratory experience using NCEP modules on Parrot Demography and Spider Biodiversity. Students completed the two exercises, pre and post self-assessments of confidence in data-analysis skills, a classroom discussion, and pre/post content assessments. Between the first and second exercises, a data-analysis teaching intervention was administered in all classes. Instructional and assessment materials were created and validated by 24 conservation educators led by the Center for Biodiversity and Conservation at the American Museum of Natural History. Results from one semester show that students scored significantly higher on post-content assessments for both exercises ( $n_1 = 207$ ,  $n_2 = 199$ ;  $P < 0.01$  both). We also found significant increases in student self-assessment of confidence in data analysis skills. However, when evaluated at the level of different skill dimensions, students' ability to represent and interpret data improved between exercises ( $n = 257$ ;  $P < 0.01$ ), but ability to complete calculations and draw conclusions was significantly worse on the second exercise ( $P < 0.01$ ). While our study demonstrates that direct instruction in data analysis does improve student performance overall, there is a disconnect between student self-assessment of their data-analysis skills and their actual ability. Consequently, some aspects of data analysis may require different teaching intervention approaches. Implications for public understanding of conservation data will be discussed, as will the flexibility of NCEP modules.

Mon-AM1-C-4

## **Growth Rates, Sex Ratios, and Fecundity of Co-occurring Shrimp from the East River, New York**

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*Palaemonetes vulgaris* and *Crangon septemspinosa* are among the co-occurring native shrimp in the New York City estuarine system. *Palaemon macrodactylus* is a recently introduced non-native shrimp species to this area. The potential impact, if any, of this non-native shrimp on the native shrimp populations needs to be evaluated. Thus, we engaged in a study to evaluate the growth rates, fecundity and sex ratios for co-occurring native and non-native shrimp from the East River, NY. Collections made in 2010 from the East River in the vicinity of Maritime College in the Bronx comprised populations of *Palaemonetes vulgaris*, *C. septemspinosa*, and *Palaemon macrodactylus*. A total of 253 shrimp were collected of which 100 were *Palaemonetes vulgaris*, 135 *C. septemspinosa*, and 18 *P. macrodactylus*. The growth rates were 3.87, 3.52, and 3.63 for these species, respectively. The sex ratios of females to males for these shrimp were found to be: 1.0:2.68, 2.30:1.00, and 1.0:0.80, respectively. *Palaemonetes vulgaris*, which ranged in size from 2.59 cm to 3.72 cm, had an average fecundity of 362 eggs. *Crangon septemspinosa* (2.82 cm to 4.45 cm) had an average fecundity of 1336 eggs. *Palaemon macrodactylus*, with a size range of 3.51 cm to 5.00 cm, had an average fecundity of 1224 eggs. All shrimp showed an increase in fecundity with an increase in size, as one would expect. In examining a member of each shrimp species of approximately the same size (3.5 cm), it was found that *Palaemonetes vulgaris* had an egg count of 415, *C. septemspinosa* had an egg count of 1506, and *Palaemon macrodactylus* had an egg count of 591, clearly showing that *C. septemspinosa*'s fecundity is 3 times higher than that of the other two shrimp of this size. The rate of growth for *Palaemon macrodactylus* was slightly less than that for *Palaemonetes vulgaris* but greater than that of *C. septemspinosa*.

Sun-AM2-B-3

## **An Update on Regional Conservation Planning Efforts for Two Rare Turtle Species in the Northeastern US**

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In the northeastern US, regional conservation planning programs are currently underway for two long-lived, semi-terrestrial freshwater turtles: *Emydoidea blandingii* (Blanding's Turtle) and *Glyptemys insculpta* (Wood Turtle). These species rely seasonally on both wetland and upland habitats, have life-history characteristics that make populations especially vulnerable to adult mortality due to habitat loss and fragmentation, are of conservation concern throughout the region, and are listed as "Endangered" by the IUCN. Over 40 biologists and land managers from agencies, universities, NGOs, and private industry from 5 and 12 states, respectively, have teamed up as part of formal working groups through Northeast Partners for Amphibians and Reptile Conservation (NEPARC) to prioritize and coordinate conservation, management, and monitoring activities for both species throughout the northeast region. Goals of the efforts are to identify priority sites for conservation and management, create management plans for priority sites, develop and implement standardized regional monitoring programs, and establish meaningful and productive partnerships with additional agencies, land owners, land-trusts, and managers to help secure and manage high-priority parcels. As part of this effort, we have devised a two-tiered regional monitoring strategy that utilizes broad-scale occupancy and abundance sampling to detect population trends across the region and spatial mark-recapture methods to estimate population density at key sites. Results from 2012, our first regional sampling year, suggest the monitoring program is useful for prioritizing sites and establishing regional baseline abundance estimates. We will provide an update on the progress of these two efforts, and we are seeking critical feedback on our conservation planning, site prioritization, and monitoring approaches, as well as new partners and technical reviewers willing to engage in the process.

Sun-AM1-C-4

## **Prevalence of *Batrachochytrium dendrobatidis*, Causal Agent of Amphibian Chytridiomycosis, in Oswego County**

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The chytrid fungus *Batrachochytrium dendrobatidis* has been responsible for notable population declines and extinctions of amphibians globally. Until recently, there has been limited data on the presence and prevalence of this fungus in local NYS amphibian populations. A total of 81 amphibians were sampled from various habitats at the Rice Creek Field Station in Oswego County between April and November 2012 as part of a long-term study monitoring amphibian populations and emerging diseases. Swabs collected from the individuals were analyzed for the presence of *B. dendrobatidis* using a standardized end-point PCR protocol. *Batrachochytrium dendrobatidis* was detected in approximately 30% of the sampled amphibians so far. The fungus was detected on Green Frogs (*Lithobates clamitans*), Bull Frogs (*Lithobates catesbeianus*), Spring Peepers (*Pseudacris crucifer*), and Two-lined Salamanders (*Eurycea bislineata*), with a tentative prevalence rate of 33, 50, 20, and 14%, respectively. Chytrid fungus was only detected on amphibians during April, May, June, August, and September of the sampling period, which suggests that prevalence of *B. dendrobatidis* may fluctuate seasonally. June and September had the highest rates of amphibians infected with *B. dendrobatidis* at 32 and 48%, respectively. This represents the first time that *B. dendrobatidis* has been documented in amphibians of Oswego County.

Sun-PM2-C-3

## Changes in Nutrient Cycling as a Result of Eastern Hemlock Removal

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Decline of the foundation species *Tsuga canadensis* (Eastern Hemlock) due to the spread of the invasive insect *Adelges tsugae* (Hemlock Woolly Adelgid) and salvage logging is expected to greatly alter ecosystem structure and function in formerly hemlock-dominated forests of the eastern US. At Smith College's MacLeish Field Station in Whately, MA, patches of early-successional deciduous forest, dominated by *Betula lenta* (Black Birch), have developed within a larger hemlock-dominant forest matrix that was selectively logged in the late 1980s. These paired patches of adjacent mature hemlock and young birch forest provide an "accidental experiment" with a robust paired-plot design that can be used to investigate the effects of hemlock loss. We quantified throughfall precipitation chemistry, litter input and decomposition rates, and soil chemistry in pairs of mature hemlock-dominated and young birch-dominated forest plots in order to infer changes in nutrient cycling as a result of hemlock removal. Results showed that deposition of base cations ( $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ , and  $\text{K}^{+}$ ) contributed by throughfall tended to be greater in hemlock-dominated forests than in birch-dominated forests ( $P = 0.10$ ,  $P = 0.09$ ,  $P < 0.01$ , respectively) and that decomposition rates of hemlock needles and birch leaves did not differ between forest types ( $P > 0.20$ ). Soil acidity was comparable in hemlock-dominated and birch-dominated forests, and higher than in a nearby mature deciduous forest plot. Net nitrification rates in soil were comparable in hemlock-dominated and birch-dominated forest plots, but lower than those in a nearby mature deciduous plot. These findings suggest that canopy cover has a large influence on nutrient input to the forest floor contributed by throughfall, that differences in microclimate between the two forest types were not significant enough to alter decomposition rates of litter, and that twenty years after logging of hemlock, soil chemistry does not appear to significantly differ between the two forest types.

Sun-AM2-A-3

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