

# 2019 Northeast Natural History Conference

## Oral Abstracts

Listed in alphabetical order by first-listed presenter (presenter names are in bold). Code at the bottom of each abstract indicates when in the conference schedule the presentation will be given: Day-Session-Room-Presentation # (thus, for example, Sun-AM2-E-4 indicates the presentation will be the 4<sup>th</sup> presentation in Room E in the Sunday Late Morning concurrent session time slot).

## Quantifying the Effects of Habitat Disturbance on *Crotalus horridus* (Timber Rattlesnake) in Pennsylvania

**Jonathan Adamski** (East Stroudsburg University, East Stroudsburg, PA) and Thomas LaDuke (East Stroudsburg University, East Stroudsburg, PA)

**Abstract** - This project examined the relationship between anthropogenic habitat disturbance and population levels in *Crotalus horridus* (Timber Rattlesnake). This study relied on population and habitat information collected by the Pennsylvania Fish and Boat Commission (PFBC) during a previous study known as the Timber Rattlesnake Assessment Project (TRAP). Geographic information science (GIS) was utilized to measure features such as canopy, trails, and road cover through habitat utilized by Timber Rattlesnakes. Using the information from TRAP, in conjunction with GIS technology, quantitative results were produced and analyzed to construct a clear picture of how human interactions affect Timber Rattlesnake populations. Two models were primarily used to explore this relationship: a linear model relating population size as a function of habitat features, and a generalized linear model relating presence-absence data as a function of habitat features. An inverse relationship was found between rattlesnake populations and proximity and density of buildings. Additionally, roads, trails, and buildings were farther away from occupied sites when compared to unoccupied sites. These 2 findings suggest that anthropogenic disturbance impacts Timber Rattlesnakes negatively in the commonwealth. The weak relationships between the variables assessed may be, in part, attributable to the use of TRAP reports which were mostly based on 1 or 2 site visits and not intended to provide population estimates. Further work will be necessary to refine our models, including improved population estimates and expanding our work to the entire commonwealth.

Sun-PM2-A-1

## Identifying Patterns for Garlic Mustard Invasion Success

**Anna G. Aguilera** (Simmons University, Boston, MA), Laurel J. Anderson (Ohio Wesleyan University, Delaware, OH), Danielle Garneau (SUNY Plattsburgh, Plattsburgh, NY), Kristy Hopfensperger (Northern Kentucky University, Highland Heights, KY), Kevyn Juneau (University of Wisconsin River Falls, River Falls, WI), Jason Kilgore (Washington and Jefferson College, Washington, PA), Mary Beth Kolozsvary (Siena College, Loudonville, NY), Vikki Rodgers (Babson College, Wellesley, MA), and Rebecca A Urban (Lebanon Valley College, Annville, PA)

**Abstract** - Our work leverages the power of EREN to identify density and distribution patterns in *Alliaria petiolata* (Garlic Mustard) invasions. EREN's multi-site network and undergraduate focus are ideal for studying broadly invasive plants such as Garlic Mustard. In particular, we seek evidence to support a hypothesized positive association between Garlic Mustard and coarse woody debris. During the summer of 2017 and 2018, we randomly located 50-m transects through areas with Garlic Mustard at 8 sites spread across 6 states: Massachusetts, Ohio, New York, Kentucky, Wisconsin, and Pennsylvania. At 0.5-m intervals, we compared the distance from the nearest Garlic Mustard rosette to the transect and to the nearest coarse woody debris. We also characterized the soil and vegetation at each site. Our results show a complicated picture of association between Garlic Mustard and coarse woody debris that is dependent upon ecological context. Our continued work seeks to build a predictive model of Garlic Mustard density and distribution that is dependent upon key site characteristics.

Sat-AM2-A-2

## A Tale of Two Urban Ponds—Seen Through the Lens of Emerging Dragonfly Populations

**Maria Aliberti Lubertazzi** (Liberal Arts Department, RISD, Providence, RI)

**Abstract** - Mount Auburn Cemetery (MAC) in Cambridge, MA, has been a quintessential green space in the heavily urbanizing landscape of metropolitan Boston since the 1830s. There is ample history of the land-use patterns and horticultural plantings at MAC. A legendary, long-term bird dataset has continued to be collected here for more than a century. Research on other types of wildlife has expanded in the last decade at this 71-ha cemetery-park, which includes areas with meadow, forest, and pond habitat. There are 4 separate wetlands at MAC, including Halcyon (0.70 ha—the largest) and Dell (0.04 ha—the smallest) ponds. In order to characterize the resident dragonfly community, I conducted cross-seasonal surveys of dragonfly exuviae (the last nymphal exoskeleton, shed upon emergence from the water) at these 2 ponds for 3 consecutive years. Although the diversity of emerging species is low, even for urban ponds, there is one consistent and surprising result: these 2 ponds support entirely different species communities. I will present the dragonfly data patterns, and describe other features of the ponds. I will then compare different sampling routines and present results of a pilot project assessing the potential for citizen-scientist involvement with exuviae-collection programs.

Sat-AM2-B-4

## **Butterflies as Charismatic Indicators of On-farm Habitat Quality**

**Erin E. Allen** (University at Albany, Albany, NY), Conrad Vispo (Hawthorne Valley Farmscape Ecology Program, Ghent, NY), Claudia Vispo (Hawthorne Valley Farmscape Ecology Program, Ghent, NY), and George Robinson (Biology Department, University at Albany, Albany, NY)

**Abstract** - Declining insect abundance and diversity has been partially attributed to increased agricultural intensity. Floral resource availability on agricultural lands is positively correlated with pollinator abundance and diversity, and so it may be possible to augment pollinator populations by increasing floral resources in and around crops. This study asks how 2 different native seed mixes impact pollinator diversity, specifically *Papilionoidea* (butterfly) diversity, in an agricultural landscape. Our research took place on different meadow treatments, established organically, at the Hudson Valley Farm Hub, a 486-ha (1200-acre) farm in Hurley, NY, during the summer of 2018. Treatment A, the wildflower-rich mix, contained 22 species of forbs and some grasses. Treatment B contained only 6 forbs and a greater number of grasses. The control, "treatment C", was left unseeded and allowed to regenerate from a residual agricultural seed bank. Biweekly surveys of flower-visiting insects were conducted between May and September. Analysis of variance (ANOVA) analysis revealed that treatment A attracted significantly more butterflies ( $P < 0.05$ ) compared to treatment B and the control. Rank-abundance analyses indicated treatment A attracted a greater number of species than treatment B and the control. The community on all treatments was dominated by *Pieridae* (sulphurs). Bray-Curtis analyses revealed that treatment A and B attracted similar communities. Results show that native seed mixes are one means by which land managers and farmers can increase butterfly abundance and diversity on agricultural lands.

Sat-AM1-E-4

## **Changes in Breeding and Loafing Seabird Populations in Eastern Maine: The View From Great Duck**

**John G.T. Anderson** (Island Research Center, College of the Atlantic Bar Harbor, ME)

**Abstract** - Great Duck Island in eastern Maine has been a significant seabird colony since at least the late 19<sup>th</sup> century. Populations of *Larus* (gulls), *Cepphus grylle* (Black Guillemot), and *Oceanodroma leucorhoa* (Leach's Storm Petrel) nest on the island and the surrounding tide pools have been traditional nursery grounds for *Somateria mollissima* (Common Eider Duck). Beginning in 1998, teams from the College of the Atlantic have counted all visible seabirds from the lighthouse tower at the southern end of the island at 0700 hrs from June until August (prime breeding season). Additional counts are made around the entire circumference of the island several times each season. Gull nests have been mapped and entered into a GIS. This effort has provided a 20-yr record of nesting and loafing seabirds from this location and can be used to examine possible trends in regional populations. The distribution of nesting gulls has changed dramatically during the study period, with the majority of birds now nesting in the immediate area of the light-station. Loafing eiders and guillemots have declined sharply, both in the vicinity of the tower and for the island as a whole. These trends match anecdotal accounts of similar declines elsewhere in Maine. I will discuss possible causes of these trends and their implications for the long-term health of the region's avifauna.

Sun-AM1-B-1

## **Population Study of Eastern Painted Turtles (*Chrysemys picta*) on Two Ponds In Acadia National Park**

**Sidney Anderson** (College of the Atlantic, Bar Harbor, ME)

**Abstract** - In recent years, Acadia National Park biologists have noticed large numbers of predated turtle nests on the margins of carriage roads—gravel roads maintained for recreational use by park visitors—near ponds inhabited by *Chrysemys picta* (Eastern Painted Turtle). We used hoop traps and radio transmitters to examine pond use and potential nest-site choice of female turtles at Witch Hole Pond and Aunt Betty Pond, both of which have carriage roads near their perimeters. We performed circumnavigations of both ponds to determine the extent of available natural nesting substrate. We also generated a population structure of the turtles at these 2 ponds from our 2018 data combined with 1993–2003 data, obtained from a previous study, to examine if population demographics have changed in 20 years and if so, how that may relate to available nesting substrate.

Sat-PM1-D-1

## Natural History of a Non-Native Ant-Mimicking Spider in Western New York

Jennifer L. Apple (SUNY Geneseo, Geneseo, NY)

**Abstract** - The ant-mimicking spider *Myrmarachne formicaria* (Araneae: Salticidae) is a recent arrival to North America from Europe or Asia, but little is known about its natural history in its native or invaded range. This spider mimics ants both in appearance and behavior. The first reports of its presence in New York State date to 2006. Most published accounts and iNaturalist observations of this species are from domestic settings inside or near buildings. *M. formicaria* has become noticeably more common in our campus's Roemer Arboretum in Geneseo, NY, often seen near ant nests under study, with silken shelters built on the vinyl flags marking colonies. Repeated surveys of occupied flags show the spiders are quite faithful to these shelters, which can house males, females, juveniles, egg masses, and spiderlings. To determine if these spiders are consistently associated with the mound-nesting ants or particular habitats, I employed grids of pin flags as a sampling method. Though commonly encountered near *Formica* ant nest mounds, *M. formicaria* can be found in areas devoid of such nests. The vegetation cover may also determine their presence, as I did not find *M. formicaria* in older forest with a sparse understory. In addition to using artificial substrates, *M. formicaria* builds its silken shelters in the folds of leaves located relatively close to the ground. Near houses, their shelters may be found in crevices of bark of logs in woodpiles or under the rims of plastic nursery pots. Based on observations of captive spiders, females remain in their shelters with eggs and spiderlings for an extended time. Continued work in this system includes assessing the nature of this spider's interactions with ants and other spiders and describing its life history and breeding behavior. These findings expand our knowledge of the natural history of this introduced species, which is critical to predicting its impact on the native arthropod community.

Sat-PM2-E-3

## Feeling the Squeeze: Late-season Advancement and Early-season Delays in the Phenology of a Common Amphibian

A.Z. Andis Arietta (Yale University, New Haven, CT) and David K. Skelly (Yale University, New Haven, CT)

**Abstract** - The warming trend of global climate disrupts the timing of ecological events, especially for taxa with life histories that are strictly tied to seasonal changes in habitat. In general, the result of a shift in climate results in a commensurate shift in organismal phenology. The phenology of *Rana sylvatica* (Wood Frog), a common North American anuran, is closely tied to the hydroperiod of vernal pools in which they breed and in which larvae subsequently develop. To avoid late-season desiccation, Wood Frogs are among the first amphibians to emerge from winter hibernation, often traveling over ice and snow to breeding ponds. Larvae must then develop and metamorphose before the pools dry in summer. Thus, the development and maturation of Wood Frogs is constrained by early spring temperatures at one end and hydroperiod at the other. In this study, we combine multiple long-term datasets to test for phenological shifts in habitat and development of Wood Frogs. We compared changes in pond habitat (water and air temperature, incident solar radiation, and start-of-season (SOS) estimates from a newly developed Landsat phenology algorithm) with larval development of Wood Frogs (estimated from over 16,500 unique specimens) for 40 pond populations over a 19-year span. This large dataset indicates that increasing spring temperatures and advancement in SOS of the forest canopy coincide with a contraction of the larval period. However, developmental rates within the larval period increased over the same time, presumably to keep pace with shortening hydroperiods. This shows that climate change can precipitate complex pressures in phenology mediated through multiple ecosystem-level interactions.

Sun-AM2-A-2

## Diet of an Exotic Invasive Slug Species Through Genetic Analysis

Hinatea Arieu (Université de Montréal, Montreal, QC – Canada), Érik L'Heureux (Université de Montréal, Montreal, QC – Canada), and Bernard Angers (Université de Montréal, Montreal, QC – Canada)

**Abstract** - Successful invasion of an exotic herbivore can have severe impacts on indigenous flora as well as on local herbivores. The European slug *Arion fuscus* has spread throughout northeastern North America in the last 50 years. Preliminary reports indicated this species is well established in old-growth *Acer saccharum* (Sugar Maple) forests, a habitat bearing several threatened indigenous plant species. To assess its impacts on indigenous species, we determined the plant species consumed by this species through genetic analyses of digestive contents. A sampling of several sites through spring was performed to assess whether this slug feed on specific plant species. Preliminary results show that the diversity of plants in digestive contents is very low compared to the plant diversity growing on sites. This project will help to determine whether this slug species would become a major threat if it selectively grazes on a few plant species.

Sun-AM2-C-2

## Using Citizen Science Data to Assess Eastern Meadowlark Status in Massachusetts

**Jonathan Atwood** (Mass Audubon, Lincoln, MA)

**Abstract** - *Sturnella magna* (Eastern Meadowlark) is showing substantial population declines throughout most of its North American breeding range, largely as a result of agricultural intensification and habitat loss. In Massachusetts, of 348 breeding bird atlas blocks where Eastern Meadowlarks were confirmed during 1974–1979, 87% were no longer occupied during 2007–2011. In response to this decline, Mass Audubon has petitioned that the species be listed as Threatened under the Massachusetts Endangered Species Act. In 2017, we enlisted the help of 51 volunteers who searched for Eastern Meadowlarks at 161 sites distributed among 65 towns. In 2018, twenty-eight citizen scientists surveyed 65 sites distributed among 42 towns. Meadowlarks were recorded at only 13 (6%) of the surveyed sites. We expect to continue this survey effort in 2019, focusing volunteer visits on areas which were not surveyed in 2017 or 2018 but where the species was reported during the first or second Breeding Bird Atlases. Challenges associated with using volunteers to survey private properties coupled with low densities of the target species (and resulting large amounts of negative data) will be discussed.

Sat-PM2-D-1

## A Population Assessment of *Malaclemys terrapin terrapin* (Northern Diamondback Terrapin) in the Lower Taunton River Watershed

**George F. Bancroft** (University of Massachusetts Amherst, Amherst, MA)

**Abstract**- *Malaclemys terrapin* (Diamondback Terrapin) is a brackish water turtle species found from Cape Cod, MA, south to Florida, and west along the Gulf Coast to Corpus Christi, TX. *Malaclemys terrapin terrapin* (Northern Diamondback Terrapin) is one of the 7 classified subspecies which ranges from Massachusetts to New Jersey and is listed as threatened under the Massachusetts Endangered Species Act. The healthiest and most well-documented population of Northern Diamondback Terrapins in Massachusetts is on Cape Cod. However, additional, smaller populations occur along the southern part of the state including in the lower Taunton River Watershed. Since 2016, I have conducted a mark and recapture study on this population to determine an abundance of Northern Diamondback Terrapins in the lower Taunton River Watershed. I have trapped turtles at 2 locations, Assonet Bay (Freetown, MA) and Broad Cove (Somerset, MA), both located in the southwestern part of the watershed which is tidal and affected by saltwater intrusion. I identified 3 active nesting areas, and nest-protection efforts began in the 2018 field season. From 2016 to 2018, 56 Northern Diamondback Terrapins have been marked in the Taunton River Watershed with 1 recapture and an additional dead female. With 74 percent of all captures being female, there is a potential trapping bias against juveniles and males due to confounding factors such as trap placement and females more likely to be captured at the nesting areas. Nest-protection efforts resulted in 8 fully protected nests and one partially protected nest during the 2018 study, leading to 37 total hatchling terrapins all released near the nesting area, but not included in the sample size. With a total sample size of 57 individuals and 1 recapture during the first 3 field seasons, a population estimate of Northern Diamondback Terrapins in Assonet Bay cannot yet be statistically determined. In order to develop a better understanding of potential metapopulation dynamics, expanded trapping efforts beyond Assonet Bay and Broad Cove and cooperation with other regional terrapin researchers is now being planned.

Sat-AM2-D-4

## 10 years and 1000 Turtles: Lessons about Head-starting as a Conservation Tool

**Brian Bastarache** (Bristol County Agricultural School, Dighton, MA)

**Abstract** - For nearly 40 years, head-starting has been used as a conservation tool for species of several taxa, but mostly turtles. Critics have questioned the efficacy of head-starting to bolster declining populations and raised concerns about rearing animals in captivity. As for any wildlife management technique, head-starting is not without risk. I will offer lessons learned about and techniques developed over years of head-starting turtles of various species in order to increase efficiency and minimize risk associated with this ex situ technique.

Sat-PM1-D-2

## **Are Birds Beneficial to Farming? Changing Attitudes, Conservation, and Research Needs in the Northeast**

**Anne S. Bloomfield** (Hudson Valley Farm Hub, Hurley, NY)

**Abstract** - A review of the literature and historic texts demonstrates that, throughout history there have been shifting attitudes towards birds as beneficials, pests, or both to crop production. Why does this change over time exist? And what does current research tell us about the role of birds in agriculture? The question is not only what services birds can provide to agriculture, but also what can agriculture potentially provide to birds? Farmland stewardship has the ability to play a significant role in bird conservation efforts on private lands locally and globally. Long-term avian monitoring and habitat use at the Hudson Valley Farm Hub in Hurley, NY, revealed a species list of birds interacting with crops, crop residue, and bare ground. These species have the potential to be suitable candidates in research studies in the region building upon current work on birds and their role as beneficials, pests or both in the agricultural landscape in the Northeast.

Sat-AM2-E-3

## **Phenological Response to Earlier Spring: Opportunities and Challenges in a Changing Climate**

**Sarah T. Bois** (Linda Loring Nature Foundation, Nantucket, MA)

**Abstract** - Anticipated consequences of climate change already seen in temperate regions include early spring warmup. These earlier warm temperatures may be advantageous for some species, potentially extending their growing seasons. However, we are also seeing warm springs punctuated by intermittent hard freezes. Warm weather can accelerate leaf flush in perennial woody species, potentially exposing vulnerable young tissues to damaging frosts. Earlier warming temperatures may also limit the winter chill accumulation necessary for many temperate woody shrubs. Using a combination of field observations and warming experiments and with the help of lots of interns and volunteers, I am studying the phenological response of spring warming on 8 different species of native shrubs characteristic of my study system. In addition, we investigated the phenological cycles, boom and bust cycles, and host preferences of *Malacosoma americanum* (Eastern Tent Caterpillar) in the field. Thus far, responses to warming temperatures have been species-specific. Some species were able to take advantage of the earlier spring temperatures; either leafing out or producing flowers soon after the on-set of warmer temperatures (e.g., *Vaccinium angustifolium* [Lowbush Blueberry] and *Gaylussacia baccata* [Black Huckleberry]). These species with lower chilling requirements might profit from warming winters, potentially extending their growing seasons and reproductive potential, barring any effect of late spring frosts. Species more reliant on winter chilling requirements cannot similarly respond to earlier warming, potentially limiting any advantage to longer growing season. My twig-warming experiment results compliment field data demonstrating that the stricter winter chill requirements may prohibit early spring leaf out for some species. Lack of sufficient winter chilling not only led to a considerable delay in budburst for some species, but also caused substantial changes in the chronological order of species' budburst. Differential climate sensitivities have implications for the assemblages of shrub communities with predicted warmer temperatures.

Sat-AM2-C-1

## ***Fraxinus* Diversity and Emerald Ash Borer: Delineating Species, Engaging Citizen Scientists**

**Brian M. Boom** (The New York Botanical Garden, Bronx, NY) and **Daniel Atha** (The New York Botanical Garden, Bronx, NY)

**Abstract** - A multi-institutional team led by The New York Botanical Garden (NYBG) is promoting the conservation of North American *Fraxinus* spp. (ashes) in the face of the devastating invasion by *Agrilus planipennis* (Emerald Ash Borer [EAB]). This 2-year project, now at its mid-point, has a 2-pronged approach. First, is a need to better understand *Fraxinus* diversity and taxonomy, particularly in Section *Melioides* in the eastern United States. To achieve this goal, 96 *Fraxinus* collections, representing 12 putative taxa, consisting of herbarium vouchers and samples for DNA and chromosome analyses, were gathered during the 2018 field season in 10 states. Samples for DNA study were sent to NYBG for extraction, and subsequent RADseq analysis at Texas A&M University. Samples for chromosome studies were sent to the US National Arboretum for flow-cytometry analysis to assess ploidy level, as a range of ploidy levels have been documented and may be important in *Fraxinus* speciation. Ash diversity cannot comprehensively be conserved by recognition of only a few broadly circumscribed species, thus the project's focus on understanding and recognizing cryptic, taxonomically well-supported species. At the project's conclusion, molecular and chromosome data will be combined with morphological and ecological data to produce a hypothesis for evolutionary history and relationships among North American *Fraxinus* spp. to guide their conservation. Second, the project is engaging citizen scientists in the quest for "lingering ash", those individual trees that have some degree of EAB resistance, and thus which are potentially useful in the U.S. Forest Service's EAB-resistance breeding program for *Fraxinus*. To achieve this goal, outreach is focused in the Catskills region of New York State, where there exist many suitable sites to search for lingering ash trees among the extensive stands of largely dead ash trees. In the 2018 field season, we established 5 plots in the Catskills, following US Forest Service protocols, and recruited 20 citizen scientists to survey and monitor these plots in the 2019 field season, when an additional 20 volunteers will be recruited and 5 additional plots will be established in prime locations to find lingering ash trees. This presentation constitutes a project status report.

Sun-PM2-C-5

## **Diamondback Terrapin Utilization of Wellfleet's Herring River Estuary**

**Barbara Brennessel** (Wheaton College, Norton, MA, and Friends of Herring River, Wellfleet, MA)

**Abstract** - *Malaclemys terrapin* (Diamondback Terrapin) is the only salt marsh turtle in North America. Throughout their range, along the Atlantic coast and Gulf of Mexico, terrapin populations have declined due to several factors, including harvest pressure in the early 1900s. Diamondback Terrapins are listed as a threatened species in Massachusetts. One of the most serious and current threats to the species is loss of habitat, including salt marshes and upland nesting areas. Our study site in Wellfleet's Herring River is on the northernmost edge of the range for the species. The Herring River is impaired due to the construction of a dike in the early 1900s, which impedes tidal flow into the River. It is expected that the proposed restoration of tidal flow will increase salt marsh habitat for terrapins. For the past 8 years, we have been gathering baseline information about how Diamondback Terrapins utilize the area in the Herring River Estuary. We mapped nesting sites, compared the productivity of nesting sites in the area to nearby sites on Cape Cod, and examined terrapin sightings in impaired vs pristine regions of the Herring River Estuary. We predict that habitat for Diamondback Terrapins will improve and expand with the proposed restoration of tidal flow to the estuary.

Sat-AM2-D-3

## **Response of an *Isotria medeoloides* Population to Canopy Thinning**

**William E. Brumback** (New England Wild Flower Society, Framingham, MA, Sara Cairns (retired, NH Natural heritage Bureau, Concord, NH), Molly B. Sperduto (US Fish and Wildlife Service, Concord, NH), and Carol W. Fyler (deceased).

**Abstract** - *Isotria medeoloides* (Small Whorled Pogonia) is a globally rare woodland orchid. Observed population declines in this species may be related to decreased light availability resulting from forest maturation. In 1998, a population of Small Whorled Pogonia in East Alton, NH, was partitioned into 2 groups, with one left as a control and the other subjected to canopy-reduction management. The removal of all shrubs and 25% of the tree basal area approximately doubled light transmission to the managed group. Over 20 years of monitoring has shown that the number of stems and seed capsules significantly increased in this group relative to the control group. Canopy thinning may help promote the long-term conservation of this federally threatened species. I will also present evidence of soil seed-banking potential by this orchid.

Sun-PM2-D-2

## **Earthworms Work Alone: The Combined Impact of Non-native Earthworms and Native Herbivores on Plants and Nutrient Cycling in Connecticut Old-fields**

**Robert W. Buchkowski** (Yale School of Forestry and Environmental Studies, New Haven, CT)

**Abstract** - Interactions between animals in green (production) and brown (decomposition) food chains are common in greenhouse experiments. These interactions are often invoked to explain variation in the functioning of ecosystems and are expected to exacerbate the negative effects of non-native species, including the invasion of non-native earthworm species into New England. Yet, single-site experimental manipulations of green and brown food chains together in the field are rare. I factorially manipulated earthworms, including *Lumbricus* sp. and *Aporrectodea* sp., and *Melanoplus femurrubrum* (Red-legged Grasshopper) to measure their combined impact on plants and soils in a 3-year experiment in Connecticut old-fields. I expected to see strong positive feedbacks based on existing theory. My experiment replicated the anticipated individual impacts of earthworms and grasshoppers on plant biomass and soil nitrogen cycling. Yet, I found no evidence for interactive effects between grasshoppers and earthworms or a consistent impact of either animal on the composition of the plant community. Differences in the plant community, particularly in *Solidago altissima* (Tall Goldenrod) and *Trifolium pratense* (Red Clover) dominance, were only weakly associated with animal treatments. I assessed 2 complimentary mechanisms to explain the counter-intuitive results using an ecosystem model. First, I ran simulations which demonstrate that the magnitude of earthworm and grasshopper effects were insufficient to generate rapid non-linear ecosystem effects in the presence of realistic flow rates of nitrogen. Long-term simulations suggest that weak interactive effects of grasshoppers and earthworms can only arise in scenarios when herbivore biomass reached high densities. Second, I present an example simulation where non-linear grasshopper and earthworm feedbacks do develop because they caused directional change in the plant population parameters. Directional change in plant population parameters would likely arise from plant community change. My results do not rule out green-brown chain feedbacks, but support previous evidence that their emergence may be predicated on a directional change in the plant community. Consequently, my results suggest that ecosystem analyses that do not consider differences in the plant community may fail to detect feedbacks between green and brown food chains and capture the true effects of non-native earthworm invasions.

Sun-AM2-E-2

## **Visual and Olfactory Cues Raccoons Use to Find Diamondback Terrapin Nests: Do Raccoons Learn?**

**Russell L. Burke** (Department of Biology, Hofstra University, Hempstead, NY, 11549), Rebecca A Czaja (School of Environment and Natural Resources, The Ohio State University, Columbus, OH), Sarah E Edmunds (Advanced Inquiry Program at Miami University, Wildlife Conservation Society, Bronx, NY), Christine N Kasparov (Department of Biology, Hofstra University, Hempstead, NY), Jae Byeok Yoon (Bergen Catholic High School, Oradell, NJ), and Alexandra K Kanonik (American Littoral Society, Highlands, NJ)

**Abstract** - As is true for many North American turtles, nest predation by *Procyon lotor* (Raccoon) is the primary cause of mortality of *Malaclemys terrapin* (Diamondback Terrapin) eggs laid at Jamaica Bay, NY. Nearly 100% of Diamondback Terrapin nests laid are predated in some years. Conservation practices since 1998 have included marking Diamondback Terrapin nests with conspicuous vinyl flags, potentially adding an artificial cue to natural cues left by the turtles. After initial experiments in 2003 and 2004, we again used artificial nests in 2016 and 2017 to test whether more than a decade of subsequent field work at the same site resulted in a change in Raccoon behavior. We replicated the previous experiments by constructing the same 9 artificial nest treatments and adding 4 new treatments. We also investigated the effect of soil disturbance itself using geosmin, a pungent, organic compound produced by Actinobacteria. We further tested whether detection of natural cues was affected by rainfall, using both artificial and natural terrapin nests. Our initial research using artificial nests at this site indicated that marking nests with flags did not increase predation rates, Raccoons located nests based on soil disturbance and the scent of ocean water, and Raccoons were repelled by human scent. Our follow up study confirmed that flag markers are still not important cues for Raccoons locating Diamondback Terrapin nests, but those results indicated that the scent of ocean water did not increase Raccoon predation and human scent did not repel Raccoons. Geosmin increased predation rates. We found that predation rates on natural and artificial nests were inversely correlated with the amount of rain on the day nests were laid/constructed, and heavy rainfall the evening after a nest is laid can dramatically reduce predation rates. These results indicate that Raccoons in Jamaica Bay continue to locate nests primarily by relying on cues related to soil disturbance rather than other visual markers, moisture, or olfactory cues, and that selection may favor turtles that nest soon before heavy rainfall, which mask those cues.

Sat-AM2-D-1



## Abundance of Six Moth Species in Carlisle, MA, from 2012-2018

Peter R. Burn (Biology Department, Suffolk University, Boston, MA)

**Abstract** – I have photographed and counted the moths and other insects attracted to porch lights at a residence in Carlisle, MA, daily since 2012. The 6 most abundant moth species show consistent (although individual) patterns of seasonal abundance, while varying considerably both day to day and year to year. Most of the species show a single peak of abundance (= generation) per year in Carlisle, while one (*Campaea perlata* [Pale Beauty]) shows 2. The invasive *Operopthera brumata* (Winter Moth) has declined significantly since 2012, which may be due to control efforts, or to weather anomalies. The other 5 most abundant species (*Speranza pustularia* [Lesser Maple Spanworm Moth], *Hypoprepia fucosa* [Painted Lichen Moth], *Dolichomia olinalis* [Yellow-fringed Dolichomia Moth], *Sunira bicolorago* [Bicolored Sallow], and Pale Beauty) do not show any consistent trend. Declines in insect abundance have become an area of considerable concern, and long-term studies are important in order to reveal such patterns, as well as changes in seasonal occurrence which may result from climate change.

Sat-PM2-E-4

## A Civically Engaged Conservation Biology Course Increased Student Investment in Learning

Jameson F. Chace (Salve Regina University, Newport, RI)

**Abstract** - Beyond service learning, civic engagement embeds a community partner into a course to enhance student learning with application of theory and concept to towards an authentic and practical problem. In spring 2018, the Newport Tree Society was invited to participate in a sophomore level Conservation Biology course at Salve Regina University. Thirty students working with the Tree Society applied conservation biology concepts to develop a 10-year strategic plan to achieve arboretum status of level 3 during. Compared to previous courses, less content was covered during lecture time to create time for the community-based project. Greater ownership of course material was placed upon the students to learn on their own time, and less content was covered overall. Working with the Newport Tree Society, along with associated visits by the Salve Regina University grounds team and Rhode Island Tree Council, gave the students a deeper understanding and appreciation for the operation of effective organizations working towards understanding, protecting, and promoting native biological diversity. The collaborative work with the Tree Society was apportioned 30% of the final grade and resulted in a 105-page arboretum plan and public presentation. Ultimately, the civically engaged course enhanced deeper student learning of some conservation biology concepts through practical application.

Sun-AM1-C-3

## Beneficial Insect-Wildflower Associations in Upstate New York: Farm Management Implications

Dylan Cipkowski (Hawthorne Valley Farmscape Ecology Program, Ghent, NY), Conrad Vispo (Hawthorne Valley Farmscape Ecology Program, Ghent, NY); Claudia Knab-Vispo (Hawthorne Valley Farmscape Ecology Program, Ghent, NY), and Kendrick Fowler (Hawthorne Valley Farmscape Ecology Program, Ghent, NY).

**Abstract** - The impact of floral resources on beneficial insect populations has been well studied in simplified landscapes. However, in the Northeast's relatively complex landscape, comparatively few such studies have occurred. We studied 2 beneficial insect groups, hover flies (Syrphidae) and wild bees (Anthophila), to (1) assess their associations with various wildflower species at farmed and unfarmed areas and (2) evaluate whether floral area of 2 plant species common in field margins and pastures, *Daucus carota* (Wild Carrot) and *Trifolium repens* (White Clover), influence their abundances. Wild Carrot floral area had a significant positive effect ( $P < 0.05$ ) on the abundances of hover flies and wild bees, while White Clover floral area had a significant positive effect on wild bee abundance, but not hover fly abundance. We described visitation rates for hover flies and other pollinators for about 20 wildflower species. These findings provide insight into hover fly flower-use, a topic understudied in the Northeast, and suggest that farmland is important to regional hover fly conservation. Moreover, the findings give useful information to farmers and land managers seeking to enhance beneficial insect populations on or around regional farms.

Sat-AM1-E-3

## **The Northern Waterthrush: Analyzing Distribution and Abundance of a Secretive Songbird in PA**

**Justin R. Clarke** (East Stroudsburg University, East Stroudsburg, PA) and Terry L. Master (East Stroudsburg University, East Stroudsburg, PA)

**Abstract** - *Parkesia noveboracensis* (Northern Waterthrush; NOWA) drastically declined in the ~20 years between the first and second Pennsylvania Breeding Bird Atlas (PBBA). This is one of the largest declines of any Pennsylvania breeding species despite higher sampling effort in the second atlas. PBBA data suggested a slight northward range contraction and detectable increase in elevation of occupied blocks, potentially caused by climate change. This study refines the second PBBA distribution and investigates factors that may be responsible for any detected changes in distribution in the core breeding range in northeastern Pennsylvania. In spring of 2017 and 2018, wetland surveys were conducted for singing males. At each of 54 sites, we conducted 2 point-counts to characterize the avian community. We also recorded vegetative, physical, and hydrological characteristics, as well as natural history and reproductive behavior. Sites occupied by NOWA were compared to unoccupied but expected-to-be-occupied sites based on the second PBBA or habitat characteristics. We found 19 occupied blocks, 3 of 6 confirmed (breeding) atlas survey blocks, 9 of the 19 possible atlas blocks, and 7 entirely new blocks. Plant communities (particularly shrubs and rooted aquatic plants) were found to be different between occupied and unoccupied sites. We compared climate indices (average precipitation and average, minimum, and maximum temperatures) between atlas years during which the northern margin of the NOWA range moved south ~10 km and the southern margin moved north ~9 km.

Sun-AM2-B-1

## **Post-release Monitoring of a Captive Bred Spadefoot Toad, *Scaphiopus holbrookii*, Population in Restored Wetlands on Cape Cod, Massachusetts**

**Jay Cordeiro** (MA Audubon Society Long Pasture Wildlife Sanctuary, Barnstable, MA) and Ian Ives (MA Audubon Society Long Pasture Wildlife Sanctuary, Barnstable, MA)

**Abstract** - *Scaphiopus holbrookii* (Eastern Spadefoot Toad) is a fossorial anuran typically found in sandy soil habitats interspersed with temporary ponds. In Massachusetts, the northernmost corner of the species' range, populations are restricted mainly to Cape Cod with isolated occurrences on the Cape Islands, South Coast, and parts of the Connecticut River Valley. The species has declined due to habitat loss and degradation and is listed as threatened in Massachusetts. As of 2016, only 33 populations had been documented in the state since 1982, with 30% not seen in 15 years or more. Recent monitoring efforts by state wildlife biologists have reconfirmed a few of these as extant. In 2011, Mass Audubon's Long Pasture Wildlife Sanctuary began to locally enhance the status of this threatened species through translocation of headstarted Eastern Spadefoot Toads obtained from Sandy Neck Barrier Beach in Barnstable to newly created wetlands at the Ashumet Holly Wildlife Sanctuary in Falmouth. Following several years of successful propagation of over 28,000 toads in captivity in Cape Cod school classrooms for translocation, we have begun to recover captured translocated individuals. Capture success has been limited, with 52 post-metamorphic translocated toads recovered since 2013 (most in pitfall traps). Capture methods include pitfall trapping, pool monitoring, digital audio recording, and visual-encounter surveys. The unique evolutionary adaptations exhibited by this species, including slow sexual maturity, and the resulting challenges in studying it contribute to the limited results we have seen to date. To increase catch per unit effort (CPUE), in 2018 we expanded our visual-encounter survey methods to include evening fixed-length trailwalk surveys and a series of line-transect surveys in suitable habitat surrounding release sites. After conducting trailwalk surveys ( $n = 10$  nights, 2.5 km each) and transect surveys ( $n = 13$  nights, 23 transects per night, 25 m each), only 4 post-metamorphic toads were recovered. We are exploring several options to increase CPUE during visual encounter surveys in 2019 including increasing number of surveys nights, transects, surveyors per night (pairs instead of individually), surveyors overall, and/or upgrading headlamp/flashlight intensity. We welcome input from others in the scientific community in this regard.

Sat-PM2-D-5

## **Using Citizen Science to Assess Amphibian Road Crossing Sites in Vermont**

**Zac Cota** (North Branch Nature Center, Montpelier, VT)

**Abstract** - Roadways significantly impact migratory amphibians via vehicle mortality and habitat fragmentation. Despite being among the most charismatic and accessible organisms for education and outreach, most migratory amphibian populations remain undocumented or overlooked by municipalities. North Branch Nature Center presents a new, scaleable, citizen science platform and standard methodology that conservation commissions and other groups can use to involve community members in identifying and quantifying local amphibian road-crossing sites. I present results of the program's pilot year in Central Vermont, and propose a system for comparing sites regionally using diversity, abundance, rarity, and mortality metrics.

Sun-AM1-A-2

## **On-farm Habitats: An Organic Farmer's Perspective**

**Jean-Paul Courtens** (Roxbury Agriculture Institute Johnstown, NY)

**Abstract** - With the exception of hunting and gathering, human food production is generally considered a threat to biodiversity. And due to the development of modern agricultural practices, rightfully so. A method of farming which includes requirements that 10% of land to be left wild, that produce is grown in soil, and that livestock and poultry be allowed to graze on pasture can provide benefits to bird, insect population, and soil health. While none of these are a requirement under current organic production rules, I will speak of the potential benefits of organic farming in terms of its original meaning: "to work in partnership with nature" whereby biodiversity is viewed as an ally to increase productivity and nutritional health of the products grown on the farm. In this presentation, I will discuss examples of cultural practices that provide habitat and increases the health of the overall farm.

Sat-PM1-E-3

## **Analysis of Cutaneous and Environmental Microbial Communities of Pre- and Post-Metamorphic North American Frogs**

**William Cranier** (Wildlife Technician Program, Mianus River Gorge, Bedford, NY) and Zach Gajewski (Dept. of Biological Sciences, Virginia Tech, Blacksburg, VA)

**Abstract** - There have been numerous attempts to control the spread of *Batrachochytrium dendrobatidis* (*Bd*) including bioaugmentation of anti-*Bd* bacteria to the amphibians' cutaneous microbiome. For bioaugmentation to be used successfully, the relationship between adult frogs, tadpoles, and their environmental microbes needs to be better understood. The objective of this project was to study the relationship between the cutaneous and environmental microbiomes of pre- and post-metamorphic frogs and their environment. By collecting and analyzing information on these microbial communities, we found substantial differences in the cutaneous microbiome that corresponded with site, species, and developmental stage. Because of the stark differences across species and pools local to each other, efforts such as anti-*Bd* bacterial treatments should occur pre- and post-metamorphosis and should be tailored to the specific pond, even across a relatively small area. This study will help to establish the role of environmental microbial communities on the cutaneous microbiome of common North American pre- and post-metamorphic frogs, which could help in developing new methods for bioaugmentation and combating *Batrachochytrium dendrobatidis* infections.

Sun-AM2-A-3

## **Genetics of Urban Coyote Colonization: Neutral and Adaptive Variation in New York City's Newest Residents**

**Alexandra L. DeCandia** (Princeton University, Princeton, NJ), Carol S. Henger (Fordham University, Armonk, NY), Amelia Krause (Princeton University, Princeton, NJ), Linda Gormezano (American Museum of Natural History, New York, NY), Mark Weckel (American Museum of Natural History, New York, NY), Christopher Nagy (Mianus River Gorge, Bedford, NY), Jason Munshi-South (Fordham University, Armonk, NY), Bridgett M. vonHoldt (Princeton University, Princeton, NJ)

**Abstract** - Theory predicts that colonization results in genetic diversity loss. Rapid reduction of population size exacerbates negative effects of genetic drift, while sustained isolation decreases neutral variation. However, amid this demographic change, natural selection can act to maintain functional diversity. Thus characterizing neutral and functional variation is critical for disentangling the evolutionary forces that shape genetic variation in newly established populations. *Canis latrans* (Coyote) provides an ideal study species for examining the genetic effects of urban colonization. Capable of thriving in environments varying from natural to highly urbanized, this mobile carnivore recently established a breeding population in New York City (NYC), one of the most densely populated areas in the United States. In this presentation, I will discuss neutral and functionally linked diversity in Coyotes sampled on a regional scale, traversing NYC and its surrounding counties in the New York metropolitan area. My coauthors and I report decreased variation and significant genotypic differentiation in NYC Coyotes following recent colonization of this super-urban environment. In accordance with our hypotheses, we observed evidence for a recent population bottleneck as Coyotes entered NYC. Counter to our expectations, we found only minimal support for selection maintaining diversity at immune-linked loci. These findings suggest that stochastic processes, such as genetic drift, are more likely driving patterns of decreased variation in super-urban Coyotes. This work not only improves our understanding of NYC's newest inhabitants, but also contributes to the growing body of knowledge surrounding the ecology of urban colonization. It highlights the importance of examining both neutral and functional variation when assessing the roles of drift and selection in newly established populations. When combined with similar studies across diverse systems, these insights can aid wildlife management and green design to better facilitate gene flow and maintain healthy populations of wildlife in an increasingly urban world.

Sun-AM1-D-2

## Impacts of Invasive Earthworms on Forest Plants

**Annise Dobson** (Yale School of Forestry and Environmental Studies, New Haven, CT), Bernd Blossey (Cornell University, Ithaca, NY), Justin Richardson (University of Massachusetts, Amherst, MA), and Audrey Bowe (Cornell University, Ithaca, NY)

**Abstract** - Northeastern North American forests experience a myriad of stressors, influencing their capacity to sustain diverse communities, provide ecosystem services, and replenish valuable timber resources. Expansions of non-native earthworms occurred simultaneous with other stressors, making it difficult to identify their impacts. I will discuss our endeavor to develop a mechanistic explanation of the individual and combined effects of earthworms and other stressors such as *Odocoileus virginianus* (White-tailed Deer) on native forest understory plant species using experimental plantings. We explored indirect methods of deer and earthworm impact on fine roots, mycorrhizal associations, and nutrient cycling. We followed transplants of 20 native understory species over 4 to 6 years. Initially, seedlings of most species had poorer establishment in earthworm-invaded plots, but by the end of the experiment, earthworms benefited 13 of 20 species and negatively affected 5. While N and P was lower overall in earthworm-invaded plots, other micronutrients were vertically translocated into the A horizon. Despite this result, we saw little rooting in the A horizon of earthworm-invaded plots, likely due to stressful rooting conditions created by earthworms. A plant's ability to incorporate rapidly mobilized nutrients into their tissues may determine their persistence in the landscape. We found some limited evidence that earthworms decreased the percent colonization by arbuscular mycorrhizal fungi (AMF) and increased or decreased the proportion of fine roots relative to total root length. However, these effects did not reliably translate to changes in seedling survival or biomass. Despite lower survival of some native plant species in earthworm-invaded plots, we were successful in establishing shade-intolerant species into forests. This result suggests that after initial changes to the forest floor from earthworm invasion have stabilized, restoration of the vegetation can be successful if it is paired with deer management.

Sun-AM2-E-3

## Estimating Dispersal of the Endangered Karner Blue Butterfly (*Lycaeides melissa samuelis*)

**Nicholas N. Dorian** (Tufts University, Medford, MA), Heidi Holman (New Hampshire Fish and Game, Concord, NH; heidi), and Elizabeth E. Crone (Tufts University, Medford, MA)

**Abstract** - Habitat fragmentation threatens species viability by reducing connectivity between populations. To understand the degree to which fragmentation isolates populations, we studied the dispersal of *Lycaeides melissa samuelis* (Karner Blue Butterfly) using a spatially explicit mark-recapture dataset collected over 8 years on the Concord Airport, Concord, NH. Conventional methods to estimate dispersal from mark-recapture datasets have 2 shortcomings, namely that estimates are (1) truncated by the search extent and (2) cannot account for unobserved movements. To account for these limitations, we estimated dispersal in a novel way: we used hierarchical multi-state mark-recapture models to fit dispersal kernels to each year of data. Across all years, Karner Blue Butterfly dispersal was low. On average, the daily probability was 0.31 for moving 200 m and just 0.02 for moving 400 m. To explore the spatial spread of a Karner Blue Butterfly population throughout the flight season, we scaled up our daily dispersal kernels to lifetime dispersal kernels by using the average Karner Blue Butterfly lifespan of 4.24 days derived from our mark-recapture models. In an average year, 46.5% of the population remained within 200 m by the end of the flight season and 95% had dispersed on farther than 786 m. Our ecological results highlight that adjacent habitat patches should be positioned within 750 m of each other to facilitate dispersal between Karner Blue Butterfly populations. Our statistical approach improved dispersal estimates for years with sparse data and enabled dispersal estimates to be made at both observed and unobserved scales. This new method presents a practical way for conservation ecologists to improve conventional dispersal estimates using pre-existing mark-recapture datasets.

Sat-AM2-B-2

## Two Centuries of Phenological Change in NY State: A Historic–Modern Citizen Science Network Story

**Kerissa Battle** (Community Greenways Collaborative, Bearsville, NY) and **Anna Duhon** (Hawthorne Valley Farmscape Ecology Program, Ghent, NY)

**Abstract** - The recent rise of large-scale citizen science platforms has begun to enable novel exploration of climate change impacts such as phenological change. Documenting the complexity of these changes, however, is often limited by the scarcity of long-term datasets with broad geographic range. The discovery of a historic network collecting phenology data from over 100 locations throughout New York State from 1826 to 1872, paired with the contemporary New York Phenology Project citizen science network that includes over 30 sites throughout the State, has allowed for a compelling new historic–modern analysis to evaluate changes in the phenology of common Northeast plant species. The combined dataset includes some of the oldest known standardized phenology data in North America and is one of the only known examples of a multi-site comparison of ground-collected historic and modern phenology data. We will describe the collaborative effort to digitize and standardize the historic dataset and reconcile it with the modern dataset, a challenging and exciting undertaking. Through an analysis of the phenophases of first flower date (FFD) and first leaf date (FLD), we will highlight species, and groups of species, that are responding most (and least) to changes in climate and explore whether variation among phenology is related to seasonality, life form, urban–rural classification, or pollination syndrome. We will talk about the potential of this historic–modern dataset for future analyses, and how this work has brought the efforts of a historic network into a modern context and has illustrated how organized long-term monitoring efforts can be valuable for ecological discovery.

Sat-PM1-C-1

## Celebrating Our Sedges Out-of-Season: Vegetative Characters and Evergreenness

**Brett Engstrom** (Northern Forest Atlas Foundation, White Creek, NY) and **Jerry Jenkins** (Northern Forest Atlas Foundation, White Creek, NY)

**Abstract** - Due to the constricted growing season in the region, the Northeastern naturalist is wont to find ways to extend the working field season. Knowing the species of sedges (Cyperaceae) in vegetative condition, or when they have only withered fertile stems, is one remedy. Sedges are valuable indicators of edaphic conditions and natural communities, especially in the Northern Forest where they are diverse and oft prevalent. In this celebratory session of sedges, we present some of our common sedges in off-season and guides to their identification by mostly vegetative characters. Sedge evergreenness, a notable feature of our upland *Carex* (sedge), is described and discussed, perhaps for the first time. Being able to identify a species throughout the seasons and its life is not only knowing the species, it is a recognition of the species' intrinsic nature.

Sat-PM2-C-4

## Consumption and Assimilation Patterns of the Eastern Box Turtle: A Diet Generalist?

**Miranda Figueras** (Department of Biology, Hofstra University, Hempstead, NY), **Kent Hatch** (LIU Post, Brookville, NY), **Timothy Green** (Brookhaven National Laboratory, Upton, NY), and **Russell Burke** (Hofstra University, Hempstead, NY)

**Abstract** - *Terrapene carolina* (Eastern Box Turtle) is a diet generalist and as such is predicted to have a diverse diet in which familiar, low-quality foods are eaten consistently at low levels, and high-quality foods are rare but eaten whenever available. Previous work showed that they feed opportunistically on seasonally available plants (shoots, leaves, flowers, and fruit), invertebrates, mushrooms, and occasionally carrion. We used fecal analysis and stable isotope analysis to test optimal foraging predictions relevant to diet generalists and also whether the diet of Eastern Box Turtles varied seasonally in a poorly studied northeastern US habitat. We found that patterns of consumption of prey species for different individuals were similar to those of the sampled population overall. Leaf and stem material was consumed by all turtles in all months despite being lower-quality than other prey available. Invertebrates were also regularly consumed; Coleopterans were the most common invertebrates eaten. Snails were eaten relatively rarely, and mushroom consumption was highly variable. We measured monthly diet overlap using both Pianka's index of overlap (PIO) and the Morisita–Horn index (MH). The PIO method indicated that the pairwise comparisons of percent frequency of occurrence (PFO) by month were all significantly more similar than expected, while the MH method showed that only the July vs. August comparison was significantly similar. Eastern Box Turtle diets changed only slightly between season, and they conform to predictions of diet-generalist models usually applied to mammals. Stable isotope analysis indicated no significant differences in the  $\delta C$  and  $\delta N$  from plasma sampled throughout their active season despite seasonal consumption patterns, which may have been due to low plant digestibility reducing nutrient assimilation as well as our short study period.

Sat-PM1-D-3

## Exploring the Relationships between *Ixodes scapularis* and Introduced Earthworms in Northern Forests

**James P. Fischer** (White Memorial Conservation Center, Inc., Litchfield, CT)

**Abstract** - Exotic Lumbricidae and Megascolecidae earthworms change northern forest ecosystems by influencing soil biological communities. *Ixodes scapularis* (Black-legged Tick) is a common and well-studied soil dwelling organism due to its being a competent vector for a wide variety of tick-borne diseases. Black-legged Tick questing phenology is highly dynamic with a total of 3 life stages from at least 2 cohorts questing within each growing season in Connecticut. I detected a difference in questing tick phenology at sites with varying degrees of earthworm biomass. I assessed tick questing phenology by flagging and live trapping *Peromyscus leucopus* (White-footed Mouse) at 16 mixed hardwood forest stands. I observed a negative relationship between tick abundance and earthworm biomass in spring. Nymph ticks were active later into the season in sites with high earthworm biomass in late-summer. Increasing the amount time when juvenile tick life-stages quest simultaneously will increase the proportion of infected nymph during the following spring. I placed wild, non-engorged nymphs in enclosures under leaf litter to explore the relationship between nymph survivorship and earthworm biomass. A greater proportion of nymphs survived in sites with higher earthworm biomass. This project demonstrates that earthworms alter the soil biological community in a manner that has implications for tick-borne diseases.

Sun-AM2-E-1

## Sparcnet: Collaborative Range-wide Monitoring of the Red-Backed Salamander (*Plethodon cinereus*)

**Jill Fleming** (Patuxent Wildlife Research Center, Turners Falls, MA), **Evan H. Campbell Grant** (Patuxent Wildlife Research Center, Turners Falls, MA), Caitlin M. Fisher-Reid (Bridgewater State University, Bridgewater, MA), Kristine L. Grayson (University of Richmond, Richmond, VA), Sean C. Sterrett (Monmouth University, West Long Branch, NJ), Chris Sutherland (University of Massachusetts, Amherst, MA), and David A.W. Miller (Pennsylvania State University, University Park, PA)

**Abstract** - SPARCnet (Salamander Population Adaptation Research Collaboration Network) is a range-wide monitoring network with the objective of understanding the effects of climate change and land use on terrestrial salamanders. Because of its abundance and its ecological role in energy transfer and nutrient cycling, *Plethodon cinereus* (Red-backed Salamander) is an important component of forest floor ecosystems within its range, particularly hardwood forests of the Northeast. The network collects count and mark-recapture data using standardized protocols that allow for rigorous cross-range analyses. Currently, there are collaborators studying populations throughout the species range, spanning the northeastern US and southeastern Canada and into the Midwest. Collaborators include educators from the elementary school to university level, and researchers at universities and government agencies. With partners studying populations that are representative of northern hardwood forest habitat distribution, the network conducts critical analyses of drivers of ecosystem change, e.g., the ecological effects of the depth at which the soil freezes. Through the Red-backed Salamander, a species that plays an integral role in Northeast forest habitats, the novel design of SPARCnet's monitoring partnership enables strong ecological inference while simultaneously developing educational tools and fostering public engagement.

Sat-AM2-B-3

## **Ant Assemblages in Vegetable Crops and Crop-Adjacent Habitats in the Hudson Valley, New York**

**Kendrick O. Fowler** (Hawthorne Valley Farmscape Ecology Program, Ghent, NY), Conrad Vispo (Hawthorne Valley Farmscape Ecology Program, Ghent, NY), and Dylan Cipkowski (Hawthorne Valley Farmscape Ecology Program, Ghent, NY)

**Abstract** - The activity of ants (Hymenoptera: Formicidae) shapes the structure and function of most terrestrial ecosystems. Little work, however, has been done to investigate ants' role in agroecosystems in northeastern North America. In 2010 and 2017, the Hawthorne Valley Farmscape Ecology Program conducted insect surveys at 20 farms in Columbia County, NY, with the goal of elucidating the structure of insect communities in and around vegetable crops. We collected data describing ant populations in vegetable crop fields and in crop-adjacent habitats as part of those surveys. Ant species' relative abundances changed across a series of habitat categories (vegetable crop fields; sites dominated by herbaceous vegetation, such as pastures; and sites dominated by woody vegetation, such as hedgerows or woodlands) that were defined a priori and that roughly corresponded with patterns in vegetation structure. Further, ant assemblages collected from vegetable crops were less even and had fewer common species than those collected from adjacent habitats dominated by either herbaceous or woody vegetation, and were more similar to ant assemblages collected from sites dominated by herbaceous vegetation than to assemblages collected from sites dominated by woody vegetation. Some of the ant species in the present study have been observed attacking common crop pests in predation experiments, and might therefore be useful foci for the development of new conservation biocontrol strategies; more work is needed here, and the present study offers a starting point for future investigations. Hypothetical farm management practices designed to promote populations of common northeastern ants might concomitantly encourage populations of 2 rare ant species observed during the insect surveys, creating an opportunity for synergy between food production and biodiversity conservation. In addition to the work discussed above, insect surveys were conducted at the Hudson Valley Farm Hub in Hurley, NY (in Ulster County), in 2017 according to the same protocol as the 2017 surveys in Columbia County. Ants were rare in the insect samples from the Farm Hub, and understanding the reason for the sparseness of the ant populations at the Farm Hub might further illuminate the factors that affect ant populations on farms in northeastern North America.

Sat-AM2-E-1

## **The Spotted Lanternfly: Observations and Thoughts from the Frontline in Berks County, PA**

**Richard Gardner** and Heather Cuthbert

**Abstract** - Our backyard in Berks County, PA, is literally on the frontline of the invasive *Lycorma delicatula* (Spotted Lanternfly) expansion and only a few miles from its apparent introduction in this country. Research during the past year has gained many important insights into its ecology and behavior. This presentation will talk about my research and thoughts on the ecology of the Spotted Lanternfly and the hysteria now gripping everyone from home owners to farmers, politicians and "scientists".

Sat-PM1-B-2

## **Ecological Research as Education Works: EREN**

**Danielle E. Garneau** (Center for Earth and Environmental Science, SUNY Plattsburgh, Plattsburgh, NY), Laurel J. Anderson (Department of Botany and Microbiology, Ohio Wesleyan University, Delaware, OH), and Carolyn Lee Thomas (Natural Sciences and Mathematics, Ferrum College, Ferrum, VA)

**Abstract** - EREN stands for Ecological Research as Education Network and is comprised of many ecologists from primarily undergraduate institutions (PUIs) who are integrating valid ecological research into undergraduate classes. Our mission is to create a model for collaborative ecological research that generates high-quality, publishable data involving undergraduate students and faculty at PUIs, and brings "big" science to "small" institutions. Starting with 15 founders, inspired by LTER and NEON initiatives, EREN has now expanded to 369 ecologists, across 243 institutions, 41 states, and 8 countries. EREN has positively impacted many students and allowed them to gain the basic skills needed by scientists including data collection, analysis, and presentation. Faculty members have been successful embedding research in introductory and upper-level courses, as well as independent study projects. Additionally, EREN provides opportunities to address relevant ecological questions across differing geographic scales by tapping into the broad PUI network. More recent EREN plant research has facilitated asking questions with varied experimental design, exposing students to both lab and field opportunities. EREN is a supportive network of faculty mentors who have consistently proven there are effective ways to engage students in research, while simultaneously addressing the high teaching and service demands at PUIs.

Sat-AM1-A-1

## **Fowler's Toads and the Rainwater pool: A Video Study**

**Greg Gerritt** (Friends of the Moshassuck, Providence RI)

**Abstract** - The only known breeding population of *Bufo (Anaxyrus) fowleri* (Fowler's Toads) in Providence RI is found in a rainwater fed pool in the North Burial Ground, a 300+ year old cemetery. In 2013, I began taking video of these toads in all stages of development. The presentation will include several short videos of Fowler's Toads, a discussion of toad ecology in this particular location, the use of video as a tool to study and popularize nature..and the use of Green Stormwater Infrastructure as a way to create amphibian habitat.

Sun-AM2-A-1

## **Monitoring Vermont's Largest Population of Autumn Coralroot**

**Arthur V. Gilman** (Gilman and Briggs Environmental, Barre, VT)

**Abstract** - *Corallorhiza odontorhiza* (Autumn Coralroot) is one of Vermont's rarest orchids and is at the northern limit of its range in the state. A modest population in Rutland County, averaging only ~100 flowering stems, is nevertheless the largest population known in the state. First discovered in 2004 during environmental surveys for a powerline expansion, the population has been monitored annually for the past 15 years. During this time the powerline was constructed, with a portion of the population lying within the powerline's managed corridor, necessitating special management practices that to date have been effective in conserving this population. Individual Autumn Coralroot plants are challenging to monitor, especially because they cannot be effectively marked, but we have been able to track the population as a whole and will present details of its demography over this time frame.

Sun-AM2-D-3

## **Risky Business: Do Infected *Daphnia* Have a Higher Predation Risk?**

**Alyssa M. Gleichsner** (SUNY Plattsburgh, Plattsburgh, NY), **Shekina S. Moise** (SUNY Plattsburgh, Plattsburgh, NY), and **Quinn Connors** (SUNY Plattsburgh, Plattsburgh, NY)

**Abstract** - *Daphnia* are aquatic crustaceans that serve as the base of freshwater foodwebs. They are host to a variety of parasitic infections, including the fungal parasite *Metschnikowia bicuspidata*, which impact their health and survival. *M. bicuspidata* changes the appearance of infected *Daphnia* from clear to opaque, thus increasing their visibility to predators in their environment. The purpose of this research was to determine whether infected individuals are more likely to be eaten by Odonata (dragonfly) nymph predators than their uninfected conspecifics. In addition, we sought to determine whether parasite spores that are ingested by nymphs remain infective or are destroyed by the digestive process, to determine whether being ingested is beneficial to the parasite (increased distribution) or costly. We determined rate of predation for infected versus uninfected *Daphnia* individuals, as well as infection rates of ingested versus non-ingested spores. This work highlights the importance of parasites as members of ecological communities, beyond the manifestation of disease.

Sun-AM2-C-4



## **Invasive Jumping Worms: Cocoons, Climate Change and Expansion at the Northern Limit of their Range**

**Josef H. Görres** (University of Vermont, Burlington, VT) and **Maryam Nouri-Aiin** (University of Vermont, Burlington, VT)

**Abstract** - Jumping worms (*Amyntas* and *Metaphire* spp.) are highly invasive earthworms from Japan. They have been reported from 38 US states and the very southern point of one Canadian province. In Vermont, its purported current northern limit, there are 3 species that frequently co-occur (*A. tokioensis*, *A. agrestis*, and *M. hilgendorfi*). Little is known of their life history, but some traits indicate that further northerly expansion is possible. These invaders need ~90 days of freeze-free time (or about 1000 degree days, base 5) from hatchling to reproductive adult. Embryos can develop to hatchlings in 600 degree days under ideal conditions. The advance from hatchling to adult and the development of embryos to hatchling may be retarded by drought. Climate change has already increased the frost-free period along the northern limit by 10 days. Going by the 90-day freeze free period needed for maturation to reproductively maturity, these worms may be able to persist as far north as the Canadian Maritime Provinces. Embryo development may also place a limitation on the northerly expansion. What we know is that cocoons are present in large numbers through the entire year, with a fraction of these cocoons always being ready-to-hatch. This means that cocoons can take advantage of early onset of spring. The date of the last spring frost in Burlington, VT varied over the last 75 years between April 15 (2015) to as late as May 31 (1961). Early hatching pays off in years when the last spring freeze date occurs early, adding time for growth and reproduction. Another consequence of this hatching phenology is that a lengthening of the freeze-free period due to climate change may extend the spatial range of the organisms northward. From 1970 to 2000, the average winter temperatures in the Northeast rose by 2.1 °C and the growing season lengthened by 7 days, primarily due to a shift in the last freeze date in the spring. The growing season in the northeastern USA and north of the current geographic range in Canada is projected to lengthen by 29–40 days by 2100. Further northward expansion of the range of jumping worms is expected.

Sun-AM1-E-2

## **Patterns of Mammal Diversity and Abundance Across a Suburban Gradient**

**Aaron M. Grade** (University of Massachusetts, Amherst, MA), **Susannah B. Lerman** (USDA Forest Service, Amherst, MA), and **Paige S. Warren** (University of Massachusetts, Amherst, MA)

**Abstract** - Suburban habitats generally support high population densities of some species, yet lower species diversity. Mammalian diversity in backyards can be driven by human-provided resources, backyard habitat features, as well as surrounding land use and degree of human-development. We assessed patterns of mammal diversity, abundance, and activity patterns (i.e., times of day a species is generally active) across a gradient of suburbanization, identified using land-cover metrics, in western Massachusetts. We deployed camera traps in 36 backyards along a suburban gradient during the summers of 2016–2018. We then used species accumulation curves and species richness models to test for the effect of suburbanization on species diversity. We also assessed species-specific responses to suburbanization through occupancy models. Finally, we compared the activity patterns of a subset of species with the activity patterns of human residents. Preliminary results indicate that suburbanization influences mammal species communities. We found a pattern of high species richness with moderate levels of suburbanization and low species richness in the most rural and the most urban backyards. We also found species-specific responses to suburbanization in occupancy, abundance, and activity patterns. Residential lands present a unique opportunity for future species conservation with increasing land development in the Northeast. Our results show that backyards support mammalian biodiversity and suggest that residential land management recommendations should be developed to reduce human-wildlife conflict and to encourage healthy mammal populations on our residential lands.

Sat-PM2-B-1

## **Are Coyotes “Natural”? Perceptions of Coyotes in New York City**

**Tatyana Graham** (Pace University, New York, NY) and Anne H. Toomey (Pace University, New York, NY), Brielle Manzollilo (Pace University, New York, NY), and Carol Henger (Fordham University, New York, NY)

**Abstract** - By 2050, more than 65% of humans are expected to live in urban and suburban areas. This shift has gained the attention of conservation scientists and managers with more focus directed on conflict and coexistence between wildlife and urbanized populations. One species that is increasingly prominent in urban and suburban environments is *Canis latrans* (Coyote). The Coyote has established itself as a keystone predator with a regulating effect on prey populations, thus playing an important role in the functioning of the urban ecosystem. However, research has shown that negative perceptions of Coyotes are common and contribute to support for eradication-focused management strategies, such as broad-scale trapping or culling, which are expensive and largely ineffective. To better understand Coyote acceptance and non-acceptance, we conducted a comparative study of park users residing in 2 counties in the New York metropolitan area: a suburban county, where Coyotes are already established, and an urban county, where Coyotes have only recently begun to arrive. Our findings suggest that urban residents have lower levels of Coyote acceptance and higher preference for Coyote removal than suburban residents. We tested multiple predictor variables to determine which was the strongest driver of desire for removal: perception of threat to humans and pets, perception of Coyote “naturalness” in the environment, and appropriateness of expressed reaction to a hypothetical Coyote encounter. We found that perception of Coyote “naturalness” was the strongest predictor of whether people felt that Coyotes belonged in the region and thus should not be removed. Our results suggest that wildlife coexistence strategies could benefit from messages that instill in residents a sense that their local area is a place where Coyotes and other wild animals belong.

Sun-AM1-D-3

## **A Site Where a Butchered Mastodon Was Consumed and Its Skeleton Transformed into Artifacts**

**Richard M. Gramly** (Andover, MA)

**Abstract** - Discovered during 2013 and still being investigated, the CEDAR FORK CREEK site in Morrow County, north-central Ohio is this state’s first absolutely dated association of human beings and Late Pleistocene mega-fauna. To date, 75 kg of butchered Mastodon remains have been unearthed along with a lesser amount of cervid bones—perhaps belonging to extinct Moose-elk (*Cervalces scotti*). Debris from the manufacture of artifacts of proboscidean rib and tusk ivory has been recovered along with fragmentary and intact artifacts of these same materials. A limited repertoire of flaked stone tools as well as hammerstones and anvils have come to light. The absolute age of the butchered mastodon is 12,300-12,400 calendar years—thus, just prior to extinction of this species in the Great Lakes region. The search for the primary carcass of the Mastodon continues; it is thought to lie nearby within ancient pond sediments.

Sat-EVE-A-1

## **Lighting, Heating, and Cooking during the Late Pleistocene: Upper Palaeolithic Lamps in the Old and New Worlds**

**Richard M. Gramly** (Andover, MA) and Dennis J. Vesper

**Abstract** - Oil lamps made of stone and other raw materials are well known for Upper Palaeolithic cultures of Eurasia. Until recently, none of these devices had been reported from Palaeo-American sites. However, their use seems likely – given the scant evidence for hearths during the initial settlement of the New World. Here we describe an oil lamp made from a giant ground sloth vertebra from Florida and a possible lamp preform made from an ascending ramus of a proboscidean (mastodon?) lower jaw. The latter specimen was discovered at the Cedar Fork Creek site, Morrow County, OH. The fuel that would have been consumed by lamps was likely derived from marine mammals or (in season) from well-larded Caribou.

Sat-EVE-A-2

## **Amphibians and Vernal Pools: Seeing the Forest for the Trees**

**Michael P. Graziano** (Bridgewater State University, Department of Biological Sciences, Bridgewater, MA), William E. Peterman (The Ohio State University, Columbus, OH), and Stephen N. Matthews (The Ohio State University, Columbus, OH)

**Abstract** - Plants shape ecosystems, affecting both physical and chemical attributes of the landscape, and their communities are shifting worldwide as a result of multiple anthropogenic influences. Amphibians are also experiencing population shifts and declines, yet relatively few studies investigate the implications of how changing plant communities can impact amphibian populations. Studies that have investigated the effect of the plant community on amphibians focus on the capacity of leaf litter to alter the larval stage, with few investigating impacts to the adult breeding community. Our study investigates the underlying drivers of colonization of novel breeding sites by amphibians with a focus on the surrounding forest community. We created 14 ponds along a gradient of tree communities varying from oak-dominance to maple-dominance in 2014. We documented colonizing amphibians in 2015 and 2016, comprising 1114 unique captures of 12 species. Generalized linear model-based analyses performed at the community level consistently found that the tree community was a significant predictor of amphibian colonization of isolated woodland pools. These data demonstrate that changing plant communities as a result of altered disturbance regimes within the landscape have the potential to influence amphibian communities. Further, these changes were documented within contemporary forests and suggest that with increased pressures due to invasion by non-native species and climate change, amphibian communities may also respond. From a conservation perspective, we suggest activities that maintain or restore landscape-level heterogeneity to facilitate conservation efforts will benefit a robust assemblage of amphibians.

Sun-AM1-A-4

## **The Asian Longhorned Beetle Cooperative Eradication Program 10 Years Later**

**Adam Green** (Department. Of Conservation and Recreation, MA)

**Abstract-** This presentation will provide a brief review of *Anoplophora glabripennis* (Asian Longhorned Beetle) biology as well as the milestones of the cooperative eradication efforts made in the past 10 years.

Sat-PM2-E-6

## **Invertebrate Roles in Ecosystem Function: Life Underground**

**Carmen Greenwood** (SUNY Cobleskill, Cobleskill, NY; Trisha Dubie (Oklahoma State University), Kyle Risser (Oklahoma State University), Evan Booher (Oklahoma State University), Nathan Walker (Oklahoma State University), Kris Giles (Oklahoma State University; kgiles@okstate.edu), Mark Payton (Oklahoma State University)

**Abstract** - Soil-dwelling organisms are critical to the overall biological function of any soil ecosystem and its corresponding above-ground habitat. While much attention has focused on the activity of microbes, and macrofauna, such as earthworms, mesofauna in the soil, including soil mites and nematodes also play integral roles in ecosystem services provided by soil, especially in agroecosystem environments. The activity of these organisms provides a critical linkage between below-ground biodiversity and above-ground productivity. Mites, which generally constitute the most prevalent soil microarthropods, include taxa that exhibit sensitivity to certain cultivation practices and inputs. Therefore, response of certain taxa of soil mites may indicate biological integrity of agricultural ecosystems. They also play critical roles in decomposition and nutrient cycling. Indigenous entomopathogenic nematodes are also ubiquitous in the soil, susceptible to land-use practices, and contribute to background pest suppression in a wide range of agroecosystem settings. Here we present the results of 3 studies that evaluate impacts of different soil amendments, tillage (transition to no-till), and cover management practices on soil-dwelling microarthropods, and the effect of a pronounced precipitation gradient on the community composition of indigenous entomopathogenic nematodes within different agroecosystems.

Sat-AM2-E-2

## **Stigma, Pollen Tube Transmitting Track, and Epidermal Micromorphology of the Style of *Sarracenia purpurea***

**Jinyan Guo** (SUNY Oswego, Oswego, NY) and Chad Halson (SUNY Oswego, Oswego, NY)

**Abstract** - Entomophilous flowers of the genus *Sarracenia* (North American pitcher plants) have a unique umbrella-shaped style as part of the female reproductive structure. The stylar “umbrella” not only serves as a region for pollen grain capture, pollen germination, and pollen-tube transmission, but also plays an important role during pollinator–flower interactions by providing the platform for insects to collect pollen and then pollinate another flower. In this study, we collected mature and naturally pollinated flowers of *Sarracenia purpurea* (Northern Pitcher Plant) to study the anatomical and micromorphological mechanisms for pollen capture and transmission using light microscopy and scanning electron microscopy (SEM). We also studied the epidermal micromorphology of the inner and outer surfaces of the stylar “umbrella” in comparison to those of the petals, sepals, and leaves to investigate potential visual and tactile cues during pollinator–flower interactions using SEM. We found that the distal and outer regions of the stigma are covered by numerous unicellular trichomes or papillae, all of which face towards the peripheral of the flower, indicating that pollen grains are captured when insects enter the stylar “umbrella”. There are 5 pollen tube transmitting tracks, each of which starts at the stigma, runs along the “umbrella canopy”, and converges at the distal top of the “umbrella stalk”. Each pollen tube transmitting track is semi-solid, and is filled with aerenchymatous secretory tissues and accompanied by a vascular bundle to support the growth of pollen tubes. Convex epidermal cells with cuticular striations are found on both the inner and outer surfaces of the “canopy” and are very similar to those of the petals, indicating that the “canopy” may provide visual cues for pollinators. Multicellular secretory glands, which may provide olfactory cues and trichomes that are very similar to those of the pitcher leaf and may provide tactical cues for pollinators, are found on the inner epidermis of the “canopy” where pollinators collect pollen grains. Thus, these anatomical and micromorphological characteristics of the stylar “umbrella” not only provide its functions as part of the female reproductive structure but also have significant impacts on the pollination system.

Sat-AM1-C-1

## **Developmental Sequence of the Flattened and Broadened Style of *Sarracenia purpurea***

**Jinyan Guo** (SUNY Oswego, Oswego, NY) and Chad Halson (SUNY Oswego, Oswego, NY)

**Abstract** - Most flowers have slender cylindrical styles where pollen grains are received at the stigmatic tip and transmitted through the transmitting tissue or canal inside the style. The umbrella-shaped style of the genus *Sarracenia* (North American pitcher plants) is unique in that it has a flattened and broadened distal half of the style forming an “umbrella canopy” and a typical slender cylindrical proximal half of the style forming an “umbrella stalk”. The stylar “umbrella” consists of 5 fused carpels, each of which is developed from a carpel primordium. The developmental sequence in which the 5 dome-shaped carpel primordia become an umbrella-shaped structure has never been studied in detail. In this study, we sampled a series of flower buds of *Sarracenia purpurea* (Northern Pitcher Plant) that covered developmental stages from the initiation of carpel primordia to near maturity and used light microscopy and scanning electron microscopy to investigate the developmental events that lead to carpel flattening and broadening. We found that the 5 carpel primordia are congenitally fused at initiation. Each carpel primordium becomes dorsiventrally flattened and folds longitudinally towards the center of the flower forming a V-shape while the lateral margins are fused with those of adjacent carpel primordia. While the carpel primordia continue to elongate, due to relatively more meristematic activities at the distal adaxial region, the top of the fused carpel primordia starts to bend outwards towards the peripheral of the flower, even though the center of the fused primordia is still open. Continued bending and thickening eventually cause the complete closure of the fused primordia so that the lateral margins of the primordia touch each other at the proximal half forming the “umbrella stalk”, while at the distal half localized growths at the intercarpellary region of the fused primordia cause the V-shaped “umbrella canopy” to become more circular. The peripheral region of the circular “canopy” maintains its meristematic property at later developmental stages that contributes to continued marginal growth of the “canopy”, thus the broadening of the style. This developmental study provides insights into the evolution of a novel floral structure and the foundation for future genetic studies.

Sat-AM1-C-2

## **Influence of En Route Weather Over the Gulf of Mexico on the Lean Mass and Continued Migration of Birds of the Northeast**

**Mariamar Gutierrez Ramirez** (University of Massachusetts Amherst, Amherst, MA), Joely G. DeSimone (University of Montana, Missoula, MT), Michael S. Griego (University of Massachusetts Amherst, Amherst, MA), Cory R. Elowe (University of Massachusetts Amherst, Amherst, MA), and Alexander R. Gerson (University of Massachusetts Amherst, Amherst, MA)

**Abstract** - Migratory birds breed in North America and migrate to and from Mexico and Central and South America every year, traveling for thousands of miles in a perilous journey. Birds require stopover periods to rest and replenish depleted energy reserves after migratory flights. Migratory birds use fat for energy during long flights, but they also burn lean tissue resulting in significant reductions in muscle and organ masses, which can impose physiological limitations that prolong stopover. Experiments show hotter or drier conditions lead to greater depletion of lean mass in flying birds. Warming temperatures experienced en route may directly impact birds' body condition and migration rate. We test the hypothesis that drier conditions experienced en route by spring trans-Gulf of Mexico migrants will result in reduced lean mass upon arrival in the Northern Gulf coast. Further, we examine whether migrant birds with lower lean body mass have prolonged stopovers and arrive later to the breeding grounds in the Northeast. In spring 2016–2018, we banded songbirds on a barrier island in Apalachicola Bay, FL. We used plasma metabolites and quantitative magnetic resonance to accurately and non-invasively measure body condition of spring migrants on arrival. We used the Motus Wildlife Tracking System to track *Catharus ustulatus* (Swainson's Thrush;  $n = 27$ ), *C. minimus* (Gray-cheeked Thrush;  $n = 15$ ), and *Parkesia noveboracensis* (Northern Waterthrush;  $n = 29$ ) from stopover in northern Florida to the breeding range in the Northeast. Our automated radio telemetry in Florida allowed us measure local stopover duration, and redetections from the extended Motus Network in the Northeast and Canada allow us to estimate arrival time to the breeding grounds. Our research highlights the importance of full-life-cycle approach to understanding the natural history of our local and migratory species.

Sun-AM2-B-3

## **Repopulating the Endangered Puritan Tiger Beetle in the Connecticut River**

**Rodger Gwiazdowski** (Advanced BioConsulting, LLC, Shrewsbury, MA, and Department of Environmental Conservation, University of Massachusetts, Amherst, MA), Dean Rhine (Silvio O. Conte National Wildlife Refuge, Sunderland, MA), Caleb Robitaille (Department of Environmental Conservation, University of Massachusetts, Amherst, MA), Robin Saudade (Department of Environmental Conservation, University of Massachusetts, Amherst, MA), and Joseph Elkinton (Department of Environmental Conservation, University of Massachusetts, Amherst, MA)

**Abstract** - *Ellipsoptera (Cicindela puritana)* (Puritan Tiger Beetle) is a federally threatened and state-endangered species with 1 viable population left in the Connecticut River, and this talk shares preliminary results of novel approaches to restore this species throughout its range. To do this, the Silvio O. Conte National Wildlife Refuge supports a team of federal and state biologists, contractors, academics, students and volunteers. This team takes a holistic approach to discovering an intersection of habitat quality and habitat availability via habitat mapping, trophic-ecology using stable isotopes, sediment analyses, life-table methods, captive rearing, and translocation.

Sat-AM1-B-3

## **Tracking Dragons: Stable Isotopes Reveal the Annual Cycle of a Long-distance Migratory Insect**

**Michael T. Hallworth** (Smithsonian Migratory Bird Center, Washington, DC), Peter P. Marra (Smithsonian Migratory Bird Center, Washington, DC), Kent P. McFarland (Vermont Center For Ecostudies, White River Junction, VT), Sara Zahendra (Vermont Center For Ecostudies, White River Junction, VT), and Colin E. Studds (University of Maryland, Baltimore County, Baltimore, MD)

**Abstract** - Insect migration is globally ubiquitous and can involve continental-scale movements and complex life-histories. Apart from select species of migratory moths and butterflies, little is known about the structure of the annual cycle for migratory insects. Using stable-hydrogen isotope analysis of 852 wing samples from 8 countries spanning 140 years, combined with 21 years of citizen science data, we determined the full annual cycle of a large migratory dragonfly, *Anax junius* (Common Green Darner). We demonstrate that darners undertake complex long-distance annual migrations that are governed largely by temperature and involve at least 3 generations. In spring, the first generation makes a long-distance northbound movement (>650 km) from southern to northern range limits, lays eggs and dies. A second generation emerges and returns south (>680 km), where they lay eggs and die. Finally, a third resident generation emerges, reproducing locally and giving rise to the cohort that migrates north the following spring. Since migration timing and nymph development are highly dependent on temperature, continued climate change could lead to fundamental changes in the biology for this and similar migratory insects.

Sat-AM1-B-1

## Using ArcGIS to Map the Fruiting Phenology of Native and Invasive Species

Tulpen S. Hansen-Schwoebel (SUNY Geneseo, Geneseo, NY) and Suann Yang (SUNY Geneseo, Geneseo, NY)

**Abstract** - Invasive plant species pose a global threat to the health of native ecosystems due to their ability to outcompete local species for resources. It is essential to understand how invasive species function within their non-native environments, and what competition strategies they employ, to combat the spread of these invasive plants. When discussing research which can require public action, such as invasive species monitoring, it is important to make the results as accessible as possible. Mapping does this by displaying data in the context of its natural environment and providing a more impactful visual presentation. By mapping fruiting phenology at a small scale, it is possible to see variation in fruit production at the individual level. This is a novel representation of this type of data and provides a more precise visual of how invasive fruit-bearing species could interfere with native niches. Using ArcGIS, we have created maps from these data using proportional symbols with multivariable symbology (size and color) to show the location, native or invasive status, and amount of fruit produced by each plant each month. Current analysis shows invasive species, like *Lonicera morrowii* (Morrow's Honeysuckle), produce fruit for multiple months while native species, like *Rubus occidentalis* (Black Raspberry), have a fruiting season that lasts ~1 month. In addition to an extended fruiting period, invasive plants are producing a larger volume of fruit at any given time. Our presentation will examine both temporal and spatial patterns shown in these maps, as well as discuss the efficacy of using ArcMap as a visualization tool for invasive plant species research.

Sun-PM2-C-1

## Discovery of Portable Art from the Clovis Zone, Hiscock Site, NY

James B. Harrod

**Abstract** - This is the first identification of portable art sculptures at a Palaeo-American, Clovis-age site in North America. Artifacts from the late Pleistocene Clovis zone at the Hiscock site, western New York State, are stored at the Buffalo Museum of Science. Previously only 1 art object – a sandstone perforated bead – had been reported. We re-examined the collection's ivory and antler objects and found artifacts of uncommon significance or possibly ritual deposition. Apparent red ochre staining on 6 of the 11 caribou antler objects. Two ivory and 7 antler artifacts exhibit clear or probable zoomorphic figurations. Four small bone pieces—3 with abstract geometrical shapes—are comparable to an atlatl adorno identified at the Bowser Road site, southeast New York state, and these specimens also appear to have sculptural zoomorphic features. A fifth similar stone artifact has zoomorphic figuration and is interpretable as an atlatl adorno. In addition, a Mastodon tooth fragment with size approximately the same as these 5 artifacts appears poly-iconic with several figurations and is interpretable as an atlatl adorno. Thirty years of systematic excavation at Hiscock yielded the remains of (minimally) 13 or as many as 18 mastodons. Eleven antler objects, possibly two teeth, and one axis represent caribou. Only 6 other fauna are documented with only one to a few specimens for each species – mostly teeth, foot bones, or feathers: one Giant Beaver incisor, modified; two peccary teeth, one of *Mylohyus*—probably an exotic manuport; one Snowshoe Hare metatarsal fragment; Condor partial humerus wing-bone, a partial coracoid and a talon—all of which may reflect a Pleistocene range-extension or be exotic; one breast feather of Pied-billed Grebe; two back or neck feathers of Northern Oriole; and two teeth, one rib and one phalanx attributed to *Homo sapiens*. This small assemblage of non-proboscidean fauna supports the hypothesis that Hiscock is primarily a ceremonial site, with ritual mastodon kills and the deposition of other remains. Possibly some objects were contained within medicine bags or belonged to necklaces. The Hiscock faunal list and probable species depicted in portable art are compared to their parallels in Siberian ethnography and archaeological sites in order to reconstruct aspects of the spiritual and cosmological worldview of northeastern Clovis peoples.

Sat-EVE-A-3

## **Engaging Volunteers to Raise Awareness and Reduce Mortality of Pool-Breeding Amphibians**

**Laura T. Heady** (Cornell University and Hudson River Estuary Program, New Paltz, NY)

**Abstract** - During annual breeding migrations, species of conservation concern such as *Ambystoma jeffersonianum* (Jefferson Salamander), *A. maculatum* (Spotted Salamander), and *Lithobates sylvaticus* (Wood Frog) often need to cross roads on their overland journeys between forests and woodland pools, which frequently results in high mortality, even in low-traffic areas. In the Hudson River Estuary watershed, where there is no comprehensive database of known crossing sites, volunteers of the Amphibian Migrations and Road Crossings (AM&RC) Project are helping to locate amphibian road crossings throughout the 10 counties that border the estuary. Volunteers document species observed, live and dead individuals, weather conditions, and traffic, and assist amphibians safely across roads. Due to the expansive geographic focus, volunteers are self-directed and generally self-taught. Program guidance is shared primarily through the internet and email correspondence. Since the project started in 2009, more than 370 volunteers have counted 20,000 frogs, toads, and salamanders of 20 species; helped nearly 12,000 across roads; and documented at least 5700 amphibians that were killed. Species reported most frequently during migration nights include Spotted Salamander, *Pseudacris crucifer* (Spring Peeper), Wood Frog, and to a lesser degree, *Hemidactylium scutatum* (Four-toed Salamander), a High Priority Species of Greatest Conservation Need in New York. With 900 people subscribed to receive project updates and migration alerts, 100 people attending volunteer training in 2019, and consistent, positive reporting on the project by the press, the AM&RC Project provides a platform for education and outreach on habitat fragmentation, forest and woodland pool ecology, and amphibian declines, as well as a strategy for reducing mortality in local amphibian populations through a rewarding volunteer experience with direct conservation benefits.

Sat-PM2-D-3

## **High Genomic Diversity and Candidate Genes Under Selection Associated with Range Expansion in Eastern Coyote (*Canis latrans*) Populations**

**Elizabeth Heppenheimer** (Princeton University, Princeton, NJ), **Kristin E. Brzeski** (Michigan Technological University, Houghton, MI), **Joseph W. Hinton** (University of Georgia, Athens, GA), **Brent R. Patterson** (Trent University Peterborough, ON, Canada), **Linda Y. Rutledge** (Trent University Peterborough, ON, Canada), **Alexandra L. DeCandia** (Princeton University, Princeton, NJ), **Tyler Wheeldon** (Trent University Peterborough, ON, Canada), **Steven R. Fain** (USFWS National Forensics Laboratory, Ashland, OR), **Paul A. Hohenlohe** (University of Idaho, Moscow, ID), **Roland Kays** (North Carolina State University, Raleigh, NC), **Bradley N. White** (Trent University Peterborough, ON, Canada), **Michael J. Chamberlain** (University of Georgia, Athens, GA), and **Bridgett M. vonHoldt** (Princeton University, Princeton, NJ)

**Abstract** - Range expansion is a widespread biological process, with well-described theoretical expectations for the genomic outcomes accompanying the colonization of a novel range. However, comparatively few empirical studies address the genome-wide consequences associated with the range expansion process, particularly in recent or on-going expansions. Here, we leverage 2 recent and distinct eastward expansion fronts of a highly mobile carnivore, *Canis latrans* (Coyote), to investigate patterns of genomic diversity and identify variants that may have been under selection during range expansion. Using a restriction-enzyme-assisted sequencing approach (RADseq), we genotyped 394 Coyotes at 22,935 SNPs and found that overall population structure corresponded to the historical range and 2 distinct recently expanded populations. Counter to theoretical expectations for populations to bottleneck during range expansions, we observed minimal evidence for decreased genomic diversity across Coyotes sampled along either expansion front. Furthermore, we identified 12 SNPs, located either within genes or putative regulatory regions, that were consistently associated with range expansion. Of these 12 genes, 3 (*CACNA1C*, *ALK*, and *EPHA6*) have putative functions related to dispersal, including habituation to novel environments and spatial learning, consistent with the expectations for traits under selection during range expansion. Although Coyote colonization of eastern North America is well-publicized, this study provides novel insights by identifying genes associated with dispersal capabilities in Coyotes on the 2 eastern expansion fronts.

Sun-AM1-D-1

## **Migratory Patterns and Connectivity of Grasshopper Sparrows**

**Jason M. Hill** (Vermont Center for Ecostudies, White River Junction, VT) and **Rosalind B. Renfrew** (Vermont Center for Ecostudies, White River Junction, VT)

**Abstract** - Effective management and conservation of migratory bird populations requires knowledge and incorporation of their movement patterns and space use throughout the annual cycle. To investigate the little-known migratory patterns of a grassland bird species, *Ammodramus savannarum* (Grasshopper Sparrow), we deployed 180 light-level geolocators on adult male sparrows at Konza Prairie, KS, and 6 US Department of Defense (DoD) installations distributed across the species' breeding ranges. We analyzed location data from 34 light-level geolocators. Grasshopper Sparrows were present on the breeding grounds from mid-April through early October, substantially longer than previously estimated, and migrated on average ~2500 km over ~30 days. Grasshopper Sparrows exhibited strong migratory connectivity only at a continental scale. The North American Great Lakes region likely serves as a migratory divide for Midwest and East Coast Grasshopper Sparrows; Midwest populations (Kansas, Wisconsin, and North Dakota;  $n = 13$ ) largely wintered in Texas or Mexico, whereas East Coast populations (Maryland and Massachusetts,  $n = 20$ ) wintered in the northern Caribbean or Florida. By providing the most extensive examination of the nonbreeding movement ecology for this North American grassland bird species to date, we refine information gaps and provide key insight for conducting their management and conservation.

Sat-AM1-B-2

## **Legacy of *Robinia pseudoacacia* (Black Locust) Invasion and use of Ectomycorrhizal Fungi to Restore *Pinus rigida* (Pitch Pine) in the Albany Pine Bush Preserve**

Taylor R. Patterson (SUNY ESF, Syracuse, NY), **Thomas R. Horton** (SUNY ESF, Syracuse, NY), and Neil Gifford (Albany Pine Bush Preserve Commission, Albany, NY)

**Abstract** - Invasive plants can leave lasting legacies on ecosystems, including changes to ectomycorrhizal fungal (EMF) communities. Such legacies can make restoration difficult even after invaders have been removed. Previous research has identified suilloid fungi, EMF in the genera *Suillus* and *Rhizopogon*, as important in early succession. They alone can be sufficient to enable *Pinus* (pine) establishment in new areas, making them potentially useful in restoration. To examine the legacy of invasion by N-fixing *Robinia pseudoacacia* (Black Locust) on resistant EMF propagule communities for *Pinus rigida* (Pitch Pine), we carried out a soil bioassay with field soil from sites where Black Locust had recently been removed and from non-invaded sites. To test the hypothesis that suilloid fungi can improve survival and that Black Locust has a legacy effect on Pitch Pine survival, Pitch Pine seedlings were planted in a factorial field experiment (invasion history  $\times$  inoculation treatment). Our hypotheses were partially supported. Resistant EMF propagule communities in Black Locust-invaded soils had 3 EMF species, whereas there were 5 in non-invaded sites. One EMF species was present in both. A single suilloid species, *Rhizopogon pseudoroseolus*, was found, and only on seedlings grown in non-invaded soils. There was no difference in survival of field seedlings in invaded or non-invaded sites after 8 months. However, inoculation with suilloid fungi improved seedling survival, with 72% of seedlings inoculated with live spore inoculum surviving after outplanting, compared to 31% of seedlings that received autoclaved control inoculum. These results suggest that legacies of invasion by Black Locust may not be limiting restoration of Pitch Pine at the Albany Pine Bush Preserve in New York. However, restoration should make use of locally adapted fungi as inoculum for the benefits they may provide to seedling establishment and survival.

Sun-PM2-E-1

## **Land Cover Change and Forest Loss in the Woonasquatucket Watershed in Northern Rhode Island**

**Katelynn Howard** (Department of Science and Technology, Bryant University, Smithfield, RI) and **John Stachelhaus** (Department of Science and Technology, Bryant University, Smithfield, RI)

**Abstract** - We used land-use/cover data from the RIGIS database from 2003 and 2011 to determine and show changes in land cover within the northern section of the Woonasquatucket watershed resulting in a loss of forest cover. The loss was mainly the result of an increase in developed land. ARCGIS desktop was used to aggregate similar attributes in the 36-code MacConell-modified Anderson Level 3 RIGIS land-use data to create Level 1 land cover, 7-feature code attributes for the 2003 and 2011 data sets. The 2 resulting polygon feature classes were "dissolved", new polygon area attributes were calculated, and the results were statistically analyzed for land cover changes over the 8-year period. We calculated there was a statistical loss of 255 ha (630 acres) or ~2.6 km<sup>2</sup> (1 mi<sup>2</sup>) of forest cover for the 65-km<sup>2</sup> (25-mi<sup>2</sup>). Most of the changes were the result of development in smaller polygons, making these changes difficult to see in an overall graphic representation. Not surprising in a relatively densely developing urban environment such as Rhode Island, the resulting loss of forest cover was due mainly to a gain in developed land. A rough estimate of loss of carbon sequestration due to forest loss was determined in order to assess possible local impact on climate change.

Sat-AM1-D-4



## **Ectomycorrhizal Ecology of *Quercus ilicifolia* (Scrub Oak) in Fire Adapted Pine Barrens**

**Aimée T. Hudon** (SUNY ESF, Syracuse, NY), Thomas R. Horton (SUNY-ESF, Syracuse, NY), and Neil Gifford (Albany Pine Bush Preserve Commission, Albany, NY)

**Abstract** - Ectomycorrhizal (EM) fungi are thought to contribute to establishment of host plants after disturbance such as fire. Previous work demonstrates that while a diverse group of fungi are found on roots of *Pinus* spp. (pines) in undisturbed settings, a different group of fungi are found on pine seedlings after a fire. The post-fire pine symbionts occur as a resistant spore bank that can be observed using soil bioassays. The objective of our study is to investigate if this same dynamic occurs in *Quercus ilicifolia* (Scrub Oak) EM communities. We are comparing EM fungal assemblages on Scrub Oak roots collected from the Albany Pine Bush Preserve (APBP) where fire is an integral part of the plant community and is being reintroduced as a restoration tool. We collected Scrub Oak roots along with the surrounding soil from relatively undisturbed sites. We carefully removed roots from oak root systems and sorted them into morphological types (morphotypes). Soil associated with these roots were air dried to select resistant spore inoculum and used in a bioassay with lab grown Scrub Oak seedlings in a paired design with field and laboratory bioassay data linked. We will identify fungi on root tips from field and bioassay samples using the fungal barcode (nrITS region). We extracted fungal DNA to determine RFLP patterns, and sequenced the DNA of each unique RFLP pattern for submission to GenBank to identify unknown fungi. We will calculate species richness as well as Simpson's and Shannon-Weiner diversity indices for both treatments to assess if there is a difference in the EM communities colonizing on roots from the field ( $n = 32$ ) versus the lab soil bioassay ( $n = 31$ ). We expect bioassay seedlings to be colonized by a different assemblage of EM fungi than seedlings harvested in situ, suggesting early successional fungi occur in soils as a resistant spore bank. Results of this experiment may elucidate how oaks recover from disturbance and provide insight on restoration efforts of these threatened young forest habitats.

Sun-PM2-E-3

## **Spanning the (Ecosystem) Gap: Aquatic Invertebrates Subsidize Nutrients and Mercury to Riparian Songbirds**

**Allyson K. Jackson** (Purchase College, SUNY, Purchase, NY)

**Abstract** - Aquatic and terrestrial food webs are intrinsically linked through cross-ecosystem subsidies of nutrients. Despite the importance of cross-ecosystem nutrient subsidies for ecological function, bioaccumulative and harmful contaminants, such as mercury (Hg), also follow these subsidies through energy pathways. The flux of Hg out of aquatic systems may cause deleterious impacts to terrestrial species that rely on aquatic subsidies. Riparian songbirds, in particular, are sensitive to Hg effects and can be heavily dependent on the flux of emergent aquatic insects for prey sources during the breeding season. This study quantifies MeHg and carbon-13 isotope in terrestrial and aquatic invertebrate communities of the Willamette River. In 2013, I collected riparian songbird blood samples ( $n = 480$ ) and baseline aquatic and terrestrial invertebrates (non-predators and predators) at 12 sites. I then compared MeHg and carbon signatures in the base of the food web with THg and carbon-13 in blood samples from riparian songbirds. My preliminary findings indicated that terrestrial and aquatic non-predatory invertebrates differ in both Hg and carbon-13 signature, when accounting for site, date, and invertebrate family. Predatory invertebrates in terrestrial habitats showed Hg bioaccumulation and carbon signatures that suggest a reliance on aquatic-based nutrients. Preliminary data suggest that birds that forage on more aquatic based carbon (based on carbon-13 isotope) also showed higher levels of Hg in their blood.

Sun-PM2-B-6

## **A Pattern Language for Sedge Ecology**

**Jerry Jenkins** (Northern Forest Atlas Project, White Creek, NY)

**Abstract** - As part of the Atlas project, I am working on drawing pictures of ecological patterns. The key notion is that a community or habitat is a place in which the physical processes have been modified by the accumulation of biological structures in ways that increase the livability and stability of the community. I analyze this by drawing pictures showing the concurrence of physical processes and biological structures. Following Christopher Alexander, I call the set of these diagrams a pattern language. In this talk I illustrate the process with examples from sedges. I will show diagrams at 3 scales: landscape diagrams illustrating the incidence of species and groups, ecomaps showing the arrangement of species within a habitat, and process-structure diagrams showing physical process and the matching biostructures.

Sat-PM2-C-6

## **Farm Abandonment: a Bryophyte View**

**Jerry Jenkins** (Northern Forest Atlas Project, White Creek, NY)

**Abstract** - The Bennet Farm, in White Creek, NY, was last pastured about 1968 and last mowed about 1974. The cornfields are still used, and I maintain lawns and paths. The pastures and ice pond have grown back, through tall herbs and brambles, to thickets and woods. The total flora of the farm is now several hundred species, with around a hundred bryophytes. This talk is about why these bryophytes, rather than others, are here. It regards bryophytes in the temperate zone as something like vegetable mice: small active creatures that live in scraps of habitat the bigger plants don't want, and have to keep moving to find places that are suitable and safe. It follows that to think about how abandonment works, we have to think about 3 things: the way in which the large plants create islands of suitable microclimate; the way in which bryophyte substrates are generated and destroyed within these islands; and the existence of source populations to colonize new substrates. It turns out that if we take these into account, the process of bryophyte colonization looks surprisingly orderly.

Sat-PM1-E-2

## **Effects of Habitat and Diet on Mercury Exposure in Breeding Songbirds in Southeastern Massachusetts**

**Melissa Jernakoff** (Wheaton College, Norton, MA), **Janina Benoit** (Wheaton College, Norton, MA), and **Jessie L. Knowlton** (Wheaton College, Norton, MA)

**Abstract** - Mercury (Hg) is a global environmental contaminant that accumulates as methylmercury (MeHg) in aquatic food webs. MeHg can reach high levels in piscivorous birds as well as birds that feed in terrestrial environments near contaminated water bodies. MeHg is lethal to birds at high concentrations, and at more moderate levels, it can negatively impact reproduction and immune, endocrine, and neurologic function of exposed individuals. The objectives of this study are to (1) relate Hg exposure to individual diets of breeding passerines and (2) compare Hg exposure between birds living near cranberry bogs to those living in suburban areas. We used four 12-m mist nets during June and August of 2018 to capture birds in 6 different sites on powerline cuts: 3 adjacent to cranberry bogs and 3 within suburban developments in Bristol and Plymouth counties in southeastern Massachusetts. We banded and measured captured birds and drew a blood sample from the brachial vein of each bird. We measured the total mercury (HgT) in the blood samples by acid digestion and cold-vapor atomic fluorescence spectroscopy. So far, 3 species have been analyzed: *Dumetella carolinensis* (Gray Catbird), *Melospiza melodia* (Song Sparrow), and *Setophaga petechia* (Yellow Warbler). Preliminary results show blood HgT concentrations varying from 0.03 to 0.13 µg/g Hg. Blood HgT levels will be related to location and also to diet, as identified through genetic analysis of fecal samples.

Sun-PM2-B-3

## **Impacts of Alcohol in Floral Nectar on Foraging Behavior in Bumblebees**

**Patricia L. Jones** (Bowdoin College, Brunswick, ME) and **Anurag A. Agrawal** (Cornell University, Ithaca, NY)

**Abstract** - Yeasts frequently occur in flower nectar, and are likely generating low alcohol concentrations, but the impacts of floral alcohol on the foraging behavior of bees has received little investigation. We found that *Bombus* spp. (bumblebees) showed avoidance and reduced consumption of sucrose solution with alcohol concentrations above 5% by volume but not below 5% by volume. Bumblebees foraging on flowers with 1% alcohol by volume added to a sucrose solution showed less preference for the floral color they had been trained to than control bumblebees foraging on flowers containing sucrose alone. Bumblebees foraging on flowers with alcohol made more floral visits total, and more visits to novel flower colors, but visits were shorter than control bumblebees feeding on sucrose alone. Therefore, while bumblebees do not appear to be deterred by alcohol in floral nectar at low concentrations, it does change their behavior in ways that are likely to decrease pollination rates for plants.

Sat-PM1-A-2

## Cultural Insights Derived from Iroquois and Northeastern Oral Traditions of Ancient "Monsters"

**Russell Judkins** (SUNY Geneseo, Geneseo, NY)

**Abstract** - Far, far beyond any conceivable actual, direct contact with living post-Pleistocene megafauna, culturally encoded images and accounts of interactions with ancient, now extinct, animals have persisted as an important and meaningful cultural category among Native American peoples of the Northeastern region—including the Iroquois. These categories include (1) Ancient, Great or Giant Elk; (2) Ancient, Great or Giant Moose; (3) Ancient, Great or Giant Buffalo; and (4) and apparently highly significant yet more anomalous category also variously identified as Ancient, Great or Giant—Great Naked Bear, Giant Quissquiss or, often in Iroquoian sources, *Niagwahe*. It is important to note, foundationally, that Native Americans have preserved assertions of both scale of size and general relative time period with their terminologies of Great and Ancient; whereas, modern observers do something similar with scientific jargon of “post-Pleistocene megafauna.” Both make assertions about scale of time and scale of size. Ancient giant moose or elk are certainly a palaeontological possibility, as are ancient or giant buffalo (bison), but when dealing with received, traditional oral accounts of *Niagwahe*, we immediately encounter “turbulence”, i.e., identification issues and category confusion. This paper addresses key Native American myth/symbol factors, particularly from Iroquois sources, to help us see why *Niagwahe* has the enduring and persistent traditional significance it does and what possible information of scientific relevance may be suggested by it.

Sat-EVE-A-4

## Changing Precipitation Patterns and the Common Loon in the Adirondack Park, NY

**Natasha Karniski-Keglovits** (SUNY-ESF Adirondack Ecological Center, Newcomb, NY), Stacy McNulty (SUNY-ESF Adirondack Ecological Center, Newcomb, NY), Charlotte Demers (SUNY-ESF Adirondack Ecological Center, Newcomb, NY), and Nina Schoch (Adirondack Center for Loon Conservation, Saranac Lake, NY)

**Abstract** - Precipitation patterns are changing worldwide; in the northeastern United States, total precipitation is increasing, including more frequent episodes of heavy rainfall. Aquatic species, including waterbirds like *Gavia immer* (Common Loon), can be particularly vulnerable to these changes. The Common Loon is a species of special concern in New York, with reproductive rates affected by many factors including human activity, water level changes, predation, and mercury levels. Consequently, conservation initiatives have been implemented to monitor and research Common Loons throughout their range. In the Adirondacks, lakes are checked each summer for the presence of loons, and their nests are monitored to document nest success or failure. Initial data analyses from Huntington Wildlife Forest (HWF) in the central Adirondacks indicate a decreasing trend in nest success between 1986 and 2018, with nest failures increasingly attributed to water-level fluctuations compared to mammalian predation. Furthermore, total summer precipitation recorded at HWF from the same time period during the months of May through July, when loons nest, has increased, as has the variability of precipitation in the study area. Combined, this data support what has been observed on lakes with reservoirs (i.e., manually adjusted water levels), which is that nesting success for loons is tied to a consistent lake level. Because extreme precipitation events are often attributed to climate change, and as climate change is likely to continue to affect water levels, it is important to study both the current and potential impacts of water-level fluctuations on loon populations. Therefore, continued monitoring, along with devising strategies which allow loons to better adjust to more severe water-level fluctuations, will become increasingly necessary in order to maintain healthy populations of loons in the region.

Sun-PM2-B-5

## **Turtles and Agriculture: A Review**

**Erik Kiviat** (Hudsonia, Annandale, NY), Jason Tesaro (Jason Tesaro Consulting LLC, Millbrook, NY), Kristen Bell Travis (Hudsonia, Annandale, NY), and Alison Lindsay (Hudsonia, Annandale, NY)

**Abstract** - Farmland has been a fundamental but dynamic part of the northeastern US landscape since before colonial times. In recent decades, greater intensiveness of cultivation and livestock production, frequency of mowing, and use of chemical fertilizers and pesticides have heightened agricultural impacts on habitats and species. Excepting *Chrysemys picta* (Painted Turtle), all turtle species in the northeastern United States are of conservation concern, and several of the species most dependent on farmlands are also the most threatened, including *Glyptemys muhlenbergii* (Bog Turtle), *Emydoidea blandingii* (Blanding's Turtle), *Clemmys guttata* (Spotted Turtle), and *Glyptemys insculpta* (Wood Turtle). Agriculture may create high-quality nesting, foraging, thermoregulating, or overwintering habitat in the form of woodlots, cultivated fields, pastures, ditches, or farm ponds. Livestock grazing can favorably inhibit overgrowth by tall vegetation in the fens and wet meadows inhabited by Bog Turtles. Farm benefits to turtles include creation of open habitats, livestock maintenance of short vegetation, and preemption of more adverse land uses. However, use of agricultural areas puts turtles and their nests directly at risk from farm machinery, overabundant human-subsidized predators, and desiccation. Shading by crop growth can alter sex ratios in developing embryos and make hatchling dispersal more difficult, and exposure to chemicals can have detrimental effects on development, growth, and immune function. Agricultural runoff carrying silt, nutrients, and pesticides pollutes surface waters and degrades wetland and stream habitats. Although research on population-level effects of these impacts in agricultural landscapes is scant, results show that mortality from tractors can cause population declines. Although most recommended conservation measures for these species are not practical on working farms, there are practices that can reduce impacts on turtles and be feasible for farmers, especially when farmers are compensated for any loss in production. Such measures include leaving modest buffers of seminatural vegetation or late-cut herbaceous filter strips bordering wetlands and waterways; using production methods that minimize use of tractors, chemical fertilizers, or pesticides; adjusting mowing pattern, speed, and blade height; maintaining nesting habitat in safe areas; and managing marginal lands for turtle habitat.

Sat-PM1-E-1

## **Creating Habitat: Establishment and Monitoring of On-farm Native Wildflower Meadows**

**Claudia Knab-Vispo** (Hawthorne Valley Farmscape Ecology Program, Ghent, NY), Conrad Vispo (Hawthorne Valley Farmscape Ecology Program, Ghent, NY), Dylan Cipkowski (Hawthorne Valley Farmscape Ecology Program, Ghent, NY) and Erin E. Allen (SUNY, Albany, NY)

**Abstract** - The creation of native wildflower meadows on farms is being promoted as a remedy for habitat loss and as a way to reduce insecticide use. In May 2017, we initiated a native meadow trial at the Hudson Valley Farm Hub to document the use of seeded meadows by beneficial insects and spiders, as well as pests. The experimental design consists of 3 sets of three 0.2-ha (0.5-acre) experimental plots. There are 3 treatments: seed mix A, considered an ideal pollinator mix; a cheaper seed mix B; and an unseeded old field succession (control). We documented flower abundance and the insect communities (with a variety of techniques) 4 times throughout the 2<sup>nd</sup> season (2018). Both seed mixes resulted in flower-rich meadows in the second year, with flower abundance peaking in July. However, while A had abundant flowers throughout the season, B had few later in the year. The control had low flower abundance with a small peak in August. The response of the insect community to the treatments varied by insect group and inventory method. Most conclusive, but divergent, were the results for the beneficial *Bombus* spp. (bumblebees; pollinators) and wasps (pest predators and parasitoids). Bumblebees were most common in all traps in treatment A and least common in the control plots, while wasps showed the reverse pattern. This indicates that not all beneficial insects seem to have benefitted from the seeded wildflower meadows. Results from visual tallies of flower-visiting insects indicate that bumblebees visited large and showy flowers, while wasps were attracted to the inconspicuous flowers of weeds in the control plot. Some pest insects, such as weevils (Curculionidae), flea beetles (Alticini), and *Lygus lineolaris* (Tarnished Plant Bug), did occur in the seeded wildflower meadows, but tended to be more common in the control plots. These results are still preliminary, and different patterns might emerge as the meadows mature and resident insect populations evolve. However, our results do alert us to the fact that wildflower meadows designed for pollinators do not automatically serve all other beneficial insects.

Sat-AM1-E-2

## **Jailbirds: The History and Future of Herring Gulls on Rikers Island in New York City**

**Jeff Kolodzinski** (The Port Authority of New York and New Jersey, New York, NY) and Susan Elbin (NYC Audubon, New York, NY)

**Abstract** - Colonies of roof-nesting gulls have thrived in urban communities around the world. Two known colonies of roof-nesting *Larus argentatus* (Herring Gull) are established in New York City. One of these colonies is located on a large system of rooftops on Rikers Island, Bronx County, NY. Rikers Island is located less than 90 m from LaGuardia Airport, one of the nation's busiest airports. Data from aircraft-wildlife strikes suggest that the nesting colony established itself sometime around 2000. In recent years, Herring Gulls have been the most frequently struck large-bodied bird at LaGuardia Airport. In an effort to reduce hazards to aircraft, the eggs of gulls nesting on Rikers Island have been added since 2009. Despite management efforts, the number of nesting pairs continued to increase through 2014, when ~600 nesting pairs were documented. Since 2014, there have been annual decreases in colony size. The number of nesting pairs was less than 300 in 2018. Nest-management efforts have reduced the number of Herring Gull strikes at LaGuardia Airport from 26 in 2006 to zero in 2018. Concurrent with nest-management efforts, nesting adults have been banded and 4 satellite transmitters were deployed to document the movements of the gulls nesting on the island. Understanding the movements of birds using the island are expected to further reduce wildlife hazards at LaGuardia Airport and better guide management decisions in the future.

Sun-AM1-B-4

## **Using a Multi-site Collaborative Network to Study Large-scale Spatial Patterns in Freshwater Turtles**

**Mary Beth Kolozsvary** (Siena College, Dept. Environmental Studies and Sciences, Loudonville, NY), David R. Bowne, Department of Biology, Elizabethtown College, One Alpha Drive, Elizabethtown, PA), Bradley J. Cosentino (Hobart and William Smith Colleges), Laurel J. Anderson (Ohio Wesleyan University), Christopher P. Bloch (Bridgewater State University), Sandra Cooke (High Point University), Patrick W. Crumine (Rowan University), Jason Dallas (Rider University), Alexandra Doran (Elizabethtown College), Jerald J. Dosch (Macalester College), Daniel L. Druckenbrod (Rider University), Richard D. Durtsche (Northern Kentucky University), Daniel Garneau (State University of New York Plattsburgh), Kristen Genet (Anoka-Ramsey Community College), Todd S. Fredericksen (Ferrum College), Peter A. Kish (Moravian Academy), Mary Beth Kolozsvary (Siena College), Frank T. Kuserk (Moravian College), Erin S. Lindquist (Meredith College), Carol Mankiewicz (Beloit College), James G. March (Washington & Jefferson College), Timothy J. Muir (Augustana College), K. Greg Murray (Hope College), Madeline N. Santulli (Siena College), Frank J. Sicignano (Siena College), Peter D. Smallwood (University of Richmond), Rebecca A. Urban (Lebanon Valley College), Kathy Winnett-Murray (Hope College), and Craig R. Zimmermann (Rogers State University).

**Abstract** - Turtle POP, one of the Ecological Research as Education Network (EREN's) initial projects, was designed to investigate the effects of landscape characteristics on population structure in freshwater turtles. EREN is ideally designed to ask ecological questions that can be answered by standardizing protocols allowing students to collect data and compare it across multiple sites. Standardized methodology and a curriculum template made it feasible to implement the project as laboratories in undergraduate courses or independent research projects. Implementation of the study across the EREN network made sampling at a large spatial scale feasible. Landscape-scale alterations that accompany urbanization, such as changes to nesting sites and higher mortality rates due to vehicular collisions and increased predator populations, may particularly affect immature turtles and mature female turtles. We hypothesized that the proportions of adult female and immature turtles in a population will negatively correlate with landscape urbanization. To address this question, we sampled freshwater turtle populations in 11 states across the central and eastern United States. Contrary to expectations, we found a significant positive relationship between proportions of mature female *Chrysemys picta* (Painted Turtle) and urbanization. We did not detect a relationship between urbanization and proportions of immature turtles. Urbanization may alter the thermal environment of nesting sites such that more females are produced as urbanization increases. Our approach of creating a collaborative network of scientists and students at undergraduate institutions proved valuable in terms of testing our hypothesis over a large spatial scale while also allowing students to gain hands-on experience in conservation science. Additional offshoots of this project will be discussed.

Sat-AM1-A-2

## **A Truffle-finding Orchid: *Epipactis helleborine*'s Mycorrhizal Fungi and Their Role in the Orchid's Carbon Budget**

**Julian H. Koob** (SUNY ESF, Syracuse, NY and Thomas R. Horton (SUNY ESF, Syracuse NY)

**Abstract** - *Epipactis helleborine* (Broad-leaved Helleborine) is an example of a mixotrophic orchid, or a species that fulfills its carbon budget through a combination of both photosynthesis and consumption of its mycorrhizal fungi. Broad-leaved Helleborine is a non-native orchid, and is found in a variety of habitats including forest understories and urban landscapes. The naturalization of Broad-leaved Helleborine may have been partially facilitated by its parasitism of its mycorrhizal fungi, especially when considering Broad-leaved Helleborine's ecological requirements and the low light that it often receives. Here, I present data on Broad-leaved Helleborine's association with truffles (*Tuber* spp.) in New York State, discuss the role of mycorrhizal fungi in Broad-leaved Helleborine's life cycle, and the implications of further documenting its mycorrhizal fungal diversity. I also present a method for assessing Broad-leaved Helleborine's photosynthetic capabilities in relation to its mycorrhizal condition in order to further understand its invasion biology and the dynamics of its parasitism on its mycorrhizal fungi.

Sun-PM2-E-5

## **Where Coyotes and Red Fox Live: Determining Occupancy and Activity Patterns on a Suburban College Campus Using Motion Activated Camera Traps**

**Stephen Kovari** (Vassar College, Poughkeepsie, NY), Lynn Christenson (Vassar College, Poughkeepsie, NY), Margaret Ronsheim (Vassar College, Poughkeepsie, NY; maronsheim@vassar.edu), Mary Ann Cunningham (Vassar College, Poughkeepsie, NY), and Keri VanCamp (Vassar College, Poughkeepsie, NY)

**Abstract** - Many wildlife species, including mammalian carnivores, have been increasingly occupying habitat areas characterized as suburban or urban. These species appear to be well adapted to life with human disturbance, but they can exhibit variable responses to different land-use conditions. Using 21 motion-activated cameras set up across a 405-ha (1000-acre) college campus and ecological preserve (Vassar College, Poughkeepsie, NY), we evaluated the effects that forest fragmentation and human development have on occupancy of *Canis latrans* (Eastern Coyote) and *Vulpes vulpes* (Red Fox). Cameras were operated for 12 months (1 January 2018 to 20 December 2018) and recorded date and time of day for individual trapping observations. We used observations to evaluate daily as well as seasonal and spatial activity of wildlife. Using simple single season occupancy modeling in the USGS software 'Presence', we found that forest patch size was the most important positive predictor for Coyote and Red Fox occupancy. While both species avoided close proximity to buildings and roads, the model indicated they frequently utilized natural areas adjacent to areas of intense human land use. In addition, Coyote and Red Fox both exhibit more diurnal activity in the winter months and at sites further from buildings and roads. We detected *Neovison vison* (American Mink), *Urocyon cinereoargenteus* (Gray Fox), *Ursus americanus* (Black Bear) and *Lynx rufus* (Bobcat) only on the College's 213.5-ha (527.5-acre) ecological preserve. These findings could indicate that these species are either excluded from the main college campus or are rare enough to avoid detection there. These results highlight the importance of undisturbed, "naturalized" areas within urbanized landscapes, while at the same time indicating that development does not necessarily act as a barrier to occupancy of certain carnivores like Coyote and Red Fox.

Sat-PM2-B-3

## Experiential Learning through Immersive Observations of a Campus Landscape

**Michelle Kraczkowski** (University of Saint Joseph, West Hartford, CT) and **Kirsten Martin** (University of Saint Joseph, West Hartford, CT)

**Abstract** - Understanding and applying the steps of the scientific method is fundamental in undergraduate biology programs. However, the process of going beyond memorization to application is often challenging for students, as traditionally they follow steps in provided protocols, obtain results, and then interpret these to form a conclusion. With the traditional approach, the expectations are that everyone arrives at nearly the same result and conclusion. There is little room for students to grow their creativity, limited options for development of advanced critical thinking, and few opportunities for troubleshooting, which would allow students to practice adapting to real-world situations. A more holistic pedagogy that prepares students more accurately for the workplace, is utilizing experiential and project-based learning. Limitations to implementing this style often revolve around available resources, space, and coordination time. At the University of Saint Joseph, we have addressed this challenge by forming projects that utilize the campus landscape. These projects not only provide valuable opportunities for students to enhance their creative thinking skills, but they also provide experiences in application of long-term monitoring, development of scientific databases, soft-skill growth, and addressing larger ecological questions. Meeting these objectives would not be possible without the incorporation of many individuals collaborating to reach a common goal. Our 2 current large projects include: monitoring succession of a developing campus grassland and a campus-wide phenology project. We will report out on the current successes, lessons learned, and future steps of these projects.

Sun-AM1-C-2

## Understanding Boom–Bust Cycles of Invaders Can Require Long-term Data Sets and Population Structure Monitoring

**George P. Kraemer** (Purchase College (SUNY), Purchase, NY)

**Abstract** - Boom–bust dynamics of invasive species populations are not uncommon. With prodigious reproductive output and a larval dispersal stage, marine invaders might be expected to undergo short boom to bust cycles. From 1998 to 2018, I used quadrat sampling of intertidal transects to estimate the June population density and size structure of the invasive *Hemigrapsus sanguineus* (Asian Shore Crab) in the intertidal zone at a western Long Island Sound (LIS) site. The size (carapace width; CW) of *H. sanguineus* declined by almost 25% from 2005 to 2018, the result of the disappearance of larger crabs, both male and female. Since reproductive output scales with size, the loss of largest females is predicted to have reduced population reproductive output (offspring m<sup>-2</sup>) in 2018 to ~50% of production in 2005. Additionally, females of the smallest reproductively mature size class were increasingly likely to be brooding eggs (3% ovigerous for 2005–2007, 16% for 2013–2018). After initial 8-fold population growth from 1998 to a 2001 maximum, average intertidal densities declined by ~4% yr<sup>-1</sup> through 2018. However, the variability of density estimates, linked to substrate heterogeneity, required long-term (15 years) monitoring to be able to conclusively (i.e., statistically) identify trends.

Sat-AM2-B-1

## Tracking Semipalmated Sandpiper Migration from Jamaica Bay, NY

**Debra Kriensky** (New York City Audubon, New York, NY), **Susan B. Elbin** (New York City Audubon, New York, NY), **Kaitlyn L. Parkins** (New York City Audubon, New York, NY), and **Emilio Tobón** (New York City Audubon, New York, NY)

**Abstract** - Jamaica Bay Wildlife Refuge, New York, NY, is a 8500-ha (21,000-acre) urban estuary along the Atlantic Flyway in the most densely populated city in the United States. Every spring and fall, large numbers of *Calidris pusilla* (Semipalmated Sandpiper) stop in Jamaica Bay during their long-distance migration to and from their wintering and breeding grounds. In order to understand how this urban stopover site fits into their annual migration and whether it is providing the necessary resources, we tracked long-distance movements using NanoTags, small radio transmitters (0.67 g) that emit signals stored on receivers in the Motus Wildlife Tracking System. We banded and tagged 29 birds ( $n = 19$  in 2017;  $n = 10$  in 2018) at 2 locations in Jamaica Bay during spring migration. A total of 22 birds were detected continuing on their spring migration and 15 were detected during fall migration. While none were detected during the breeding season, 1 bird was detected in the fall flying from Massachusetts to French Guiana in South America. The results indicate that Semipalmated Sandpipers stopping in Jamaica Bay in spring are able to successfully continue to their breeding grounds, and that the resources they find in Jamaica Bay need to be high quality. They also demonstrate that there is a large degree of variability in the migratory routes of individual birds in both spring and fall, and highlight the need for more information about breeding and wintering locations of the eastern population of Semipalmated Sandpipers.

Sun-AM2-B-4

## **Generalist or Specialist: What Habitats are Occupied by the Invasive Slug *Arion fuscus*?**

**Érik L'Heureux** (Université de Montréal, Montreal, QC, Canada) and Bernard Angers (Université de Montréal, Montreal, QC, Canada)

**Abstract** - The invasion success of an exotic species is often attributed to its capacity to occupy multiple habitats. Indeed, in heterogeneous areas where distinct habitats are next to each other, the distribution expansion of generalist species is not blocked by successive habitats. Also, the probability of successful introduction of passively dispersed individuals is higher for habitat generalists, less dependant of the habitat type in which they have been transported, than for specialists. The European slug *Arion fuscus* is a relevant model to test this hypothesis. This species greatly expanded its distribution in Québec in the last 50 years, likely facilitated by passive dispersal via human activities. Despite the potential impacts of this invasive species, no information is available about the habitats it occupies in North America. To assess whether this species is a habitat generalist or specialist, I sampled 5 different habitat types, from natural to disturbed, in southern Québec. The results revealed that *Arion fuscus* is a generalist species. This species was detected in all habitat types sampled. This contrasts with the other slug species from this region, which are generally limited to a few habitats. This study shows the need to further study the impacts of this species across the various habitats it now occupies.

Sun-AM2-C-1

## **A Golden Opportunity: Novel GIS Applications for Rare Species Conservation**

**Steven Lamonde** (Antioch University New England, Keene, NH), Mark LaBarr (Audubon Vermont, Huntington, VT), and Margaret Fowle (Audubon Vermont, Huntington, VT)

**Abstract** - Due to rapid loss of both breeding and nonbreeding habitat, *Vermivora chrysoptera* (Golden-winged Warbler) has experienced one of the steepest declines of any North American songbird. By the early 21<sup>st</sup> century, some scientists believed this species had entirely disappeared from New England. However, targeted surveys between 2013 and 2015 uncovered a small population within Vermont's Champlain Valley, where an estimated minimum of 70 breeding pairs persisted. To gain a better understanding of Golden-winged Warbler habitat availability and distribution in the Champlain Valley, we developed a novel GIS-based approach for locating potential breeding habitat. Using National Agricultural Imagery Program orthophotos, 3 pixel-based image classification models with varying class totals quantified patterns of landcover distribution within polygons of confirmed habitat. We then used spatially distinctive patterns at the territory scale as training images for a moving-window spatial model to identify similarly configured early-successional habitat across the Champlain Valley. This focal analysis identified 4121 ha (10,183 acres) of potential habitat spread over a matrix of 8686 publicly and privately owned parcels. To validate our spatial model with field surveys, we first prioritized parcels by area and density of potential habitat and parcel size. We then surveyed 28 highest-priority parcels, containing nearly 243 ha (600 acres) of potential habitat, using a modified Golden-winged Warbler point-count protocol during May and June 2017. Approximately 85% of these parcels hosted breeding Golden-winged Warblers or congeneric *Vermivora cyanoptera* (Blue-winged Warbler), which display nearly identical habitat requirements in Vermont. Additionally, 88% of surveyed parcels contained at least 1 of 6 early-successional bird species of regional greatest conservation need. Our model complements existing efforts to boost recovery of Golden-winged Warbler populations in Vermont by providing an efficient way to identify suitable habitat for breeding *Vermivora* surveys and prioritize habitat management for early-successional, forest-dependent species. Furthermore, these results demonstrate our GIS-based analysis and parcel prioritization method as an effective approach for predicting rare species' presence within spatially complex ecosystems.

Sun-PM2-C-2

## **Microbial Responses to Pollutants in Coastal Sediments**

**Gaytha A. Langlois** (Bryant University, Smithfield, RI)

**Abstract** - I will provide an overview of some of the complex dynamics within marine benthic microbial communities, focusing on changes in composition within those communities due to climate change and exposure to pollutants, and examining the diverse adaptive mechanisms demonstrated by pollutant-tolerant microbes. Examples will include a diverse array of ciliated protozoans and diatoms observed in the Microbial Ecology Laboratory, associated with a variety of stressed environments.

Sat-AM1-D-1



## Late Pleistocene Megafauna and Humans at the Hiscock Site (Genesee County, Western New York State)”

**Richard S. Laub**

**Abstract** - During 1994 a bone-bed at the Coats-Hines locality, Franklin Williamson County, TN,—designated “Mastodon B”—was archaeologically explored. The actual remains have not been dated absolutely although charcoal and soils yielded a wide spectrum of ages—several of which might apply to the remains of a single mastodon and smaller faunal species (turtle, horse, cervid, muskrat, turkey, frog, and dog?) that were associated with it. Mastodon B was observed to be highly fragmented—a fact that does not support the idea that it is just a kill site. Manufacture of bone artifacts appears to have occurred there, and implements of flaked stone and proboscidean bone and ivory were discarded among the remains. On the face of it, the bone-bed is better regarded as a processing site or workshop. Nearby we might expect to encounter ancient habitations and perhaps the actual spot where Mastodon B met its death.

Sat-EVE-A-5

## Effects of Pollen Nutrition on Development in the Small Carpenter Bee

**Sarah P. Lawson** (Sacred Heart University, Fairfield CT;) and **Sandra M. Rehan** (University of New Hampshire, Durham, NH)

**Abstract** - By manipulating resources or dispersal opportunities, mothers can force offspring to remain at the nest to help raise siblings, creating a division of labor. In the subsocial bee *Ceratina calcarata* (Small Carpenter Bee), mothers manipulate the quantity and quality of pollen provided to the first female offspring producing a dwarf eldest daughter. The dwarf eldest daughter forages for her siblings and forgoes her own reproduction. To begin to understand how the mother’s manipulation of pollen affects the physiology and behavior of offspring, we measured the effects of pollen quantity and pollen type on offspring development, adult body size, and behavior. We found that by experimentally manipulating pollen quantities or pollen types, we could recreate the dwarf eldest daughter phenotype. This behavioral phenotype begins to explain how maternal manipulation of resources could lead to the development of the social organization and reproductive hierarchies, a major step in the transition to highly social behaviors.

Sat-PM1-A-1

## Impacts of Cannibalism on an All-Female Lineage of Salamanders

**Jasper S. Leavitt** (Trent University, Peterborough, ON, Canada), **Dennis Murray** (Trent University, Peterborough, ON, Canada), and **Thomas J. Hossie** (Trent University, Peterborough, ON, Canada)

**Abstract** - In ambystomatids, relatedness impacts the likelihood of a larva cannibalizing another, with siblings being much less likely to attack each other than unrelated individuals. Within these salamanders is the “unisexual complex”, an all-female lineage that steals sperm from male *Ambystoma* to have offspring. Notably, they often don’t incorporate the male DNA, thereby producing clones of themselves. Our work with these animals looks at cannibalism from 2 perspectives: choosing when to cannibalize and overcoming being partially eaten. For comparison, we used a pure, bisexual lineage, *Ambystoma laterale* (Blue-Spotted Salamander). We first tested whether clonal lineages would cannibalize each other at rates more like siblings or non-siblings by monitoring aggression rates over the course of 2 months. After that, we monitored regeneration rates at multiple temperatures spanning their thermal range. We found that unisexuales overall were more aggressive than *A. laterale*, regardless of kinship, with higher rates of full cannibalism events and sub-lethal aggression. We also found that unisexuales were larger in both mass and length than *A. laterale*, but they did not regenerate tails faster. They did, however, regrow tails faster at warmer temperatures than ones they were locally adapted to. These results indicate that clonality in the unisexual lineage does not confer a significant benefit to salamanders when they are larvae, and that they are potentially less cold-adapted than their primary sperm donors in the Northeast.

Sun-AM1-A-3

## Tracking Forest Change Using the Permanent Forest Plot Project

**Mark Lesser** (SUNY Plattsburgh, Plattsburgh, NY)

**Abstract** - The Permanent Forest Plot Project (PPFP) is a collaborative project designed to allow student and faculty researchers to readily access forest-plot data from across North America in order to assess forest structure across a range of sites and ecoregions. Permanent forest plots allow researchers to address questions related to changes in tree biomass, carbon accumulation, invasive species, and disturbance patterns over time, through repeated and exhaustive data sampling of plots. Importantly, the PPFP, by standardizing plot design and data-collection protocols allows researchers to address these questions, not just at their own site(s), but across the entire network. Currently 83 institutions from across North America have initiated plots and submitted data to the project. All plots are 400 m<sup>2</sup> in size. Once plots are established and general attributes (e.g., slope, aspect, climate), determined, all trees (live and dead) >2.5 cm at 1.37 m height (diameter at breast height; DBH) are identified to species, numbered, tagged, and measured for diameter. Stems measuring >1.37 m tall but <2.5 cm DBH are tallied and identified on a subsample of the plot. These data provide the basis for establishing composition and structure for the plots; while repeated measures allow for whole community, as well as species-specific, growth rates and structural changes to be calculated. Through mapping of individual trees, distribution patterns may also be assessed within and between plots. The PPFP also incorporates protocols that allow researchers to study understory vegetation, spread and impacts of *Agrius planipennis* (Emerald Ash Borer), and edge effects. The project website, which allows for data upload, querying, and download, also contains resources for instructors including activities, tips for setup, data-collection sheets, and full protocols. Involvement in the PPFP provides the basis for better student engagement and motivation than most standard laboratory exercises offer. It also provides students with a more comprehensive view of differences between local forests and those in other ecoregions. Finally, beyond the classroom experience, this project has the potential to foster collaborations that may reveal important forest patterns and dynamics across North America that would otherwise remain unidentified.

Sat-AM1-A-3

## How Can We Expand EREN's Reach?

**Kathleen LoGiudice** (Union College, Schenectady, NY), **Laurie J. Anderson** (Ohio Wesleyan University, Delaware, OH), and **Michelle L. Anderson** (The University of Montana Western, Dillon, MT)

**Abstract** - EREN has been successful in reaching many ecologists who teach undergraduates, but we believe we can do better. In this talk, we will profile the EREN membership in terms of institutional affiliations, study questions, species, ecosystem types, and levels of biological organization. We will explore how we might broaden our diversity of projects, ecosystems, locales and study organisms to better attract ecologists and their students from a more diverse array of institutions. We will also explore our options and challenges as we work to expand EREN's diversity in multiple dimensions.

Sat-AM2-A-4

## **American Kestrel (*Falco sparverius*) Nest Box Occupancy and Success in Cranberry Bogs in Southeastern Massachusetts**

**Anneliese Malachi** (Wheaton College, Norton, MA), Joey Mason (Keeping Company with Kestrels Inc., Middleborough, MA), and Jessie L. Knowlton (Wheaton College, Norton, MA)

**Abstract** - *Falco sparverius* (American Kestrel) has experienced sharp population declines in the Northeast over the past decades, leading to nest box installations in order to provide pairs with additional breeding cavities. Potential factors that may have negative effects on the nesting success of American Kestrel populations include climate change, increased human presence in breeding areas, and competition for nest cavities from *Sturnus vulgaris* (European Starling). The objectives of this study were to examine how local, landscape, and weather (temperature and precipitation) variables affect American Kestrel nest box occupancy and nest success, as well as European Starling occupancy of the same nest boxes. We monitored the use and nest success of between 28 and 34 American Kestrel nest boxes each year over 18 years (2000–2017), located in cranberry bogs across Plymouth County, MA. We recorded nest box direction, attachment (pole or tree), and presence or absence of a shrub layer under the box, which we defined as the local variables. To determine landscape-level variables, we used ArcGIS to calculate distance from each nest box to the nearest water source, other nest box, human habitation, and forest, as well as the percent area of forest, cranberry bog, agriculture, human habitation, and grassland within a 1-km radius. We then used generalized linear mixed models to quantify the effects of the local, landscape, and weather variables (mean precipitation and temperature over the nesting season of each year) on nest box occupancy by both American Kestrels and European Starlings and the number of American Kestrels fledged. We found that nest box occupancy by European Starlings increased with increasing temperature, increasing distance to nearest nest box and decreasing distance to nearest human habitation. Nest box occupancy by American Kestrels increased with decreasing distance to nearest nest box, increasing distance to nearest human habitation, and increasing distance to nearest forest. Our results suggest that placing new nest boxes near to existing nest boxes and further from human habitation will increase occupancy and success rates for American Kestrels. Finally, our results suggest that the effects of climate change may lead to increased nest box occupancy by European Starlings.

Sun-PM2-B-1

## **Spotted Lanternfly: The Latest Threat to the Commonwealth**

**Javier Marin** (MDAR, Boston, MA)

**Abstract** - The invasive *Lycorma delicatula* (Spotted Lanternfly) has started to spread from its original quarantined infestation in Pennsylvania into neighboring states. This expansion is due primarily to unintentional human-assisted transport and the Spotted Lanternfly's ability to lay egg masses on a variety of host material. While the species is not yet established in Massachusetts, state agencies such as the MA Department of Agricultural Resources have adopted a proactive approach to both outreach and surveillance in hopes of mitigating any potential impacts to the Commonwealth.

Sat-PM1-B-1

## **Monitoring the Impact of Coastal Erosion on the Nesting Habitats of *Malaclemys terrapin terrapin* (Northern Diamondback Terrapin) in Marion, Mattapoisett, and Wareham, Massachusetts**

**Danielle Marston** (NECWA, Middleboro, MA) and Carol "Krill" Carson (NECWA Middleboro, MA)

**Abstract** - The Southcoast Terrapin Project began in 2016 in collaboration with Mass Audubon at Wellfleet Bay. During its first year, staff and interns with the New England Coastal Wildlife Alliance (NECWA) found evidence of *Malaclemys terrapin terrapin* (Northern Diamondback Terrapin) residing in the marshes and coastal waters from Wareham to Mattapoisett, MA. Data was collected on predated nests found on 2 barrier beaches adjacent to local salt marshes Aucoot Marsh in Marion and Cromesett Marsh in Wareham. In 2017, NECWA expanded its research activities to include sediment and vegetation surveys of nesting areas and GIS mapping activities of nesting beaches through drone surveys. In addition to Aucoot Marsh and Cromesett Marsh, 4 more beaches were found to have nesting activity and were monitored. During early 2018, the Southcoast area of Massachusetts was hit hard by windstorms that resulted in coastal erosion caused by increased tidal and wave activity. These storms drastically altered the terrain of the monitored beaches. Aucoot and Cromesett are 2 of the locations that were the hardest hit, and a visible change to the suitable nesting area was documented. During the summer of 2018, the number of total nests found at Aucoot Marsh decreased from 90 to 39, while the total number of nests at Cromesett remained the same as the previous year. However, 90 of the 98 total nests found at Cromesett were predated during the active nesting period between 8 June and 17 July. Additionally, total nests from all the beaches in 2018 were seen to have more unviable eggs than in 2017, with an increase from 7 to 73. While it is inconclusive what caused this increase in mortality, preliminary results suggest that terrapins are experiencing a loss of suitable nesting habitat along barrier beaches and are nesting in areas that place eggs at higher risk of mortality.

Sat-AM2-D-2

## **Identifying Trees within State Parks and Forests that Pose High Risk to the Public and Infrastructure Utilizing ESRI's 123 Survey Tool**

**Christopher Martin** (Forestry Director, Connecticut Department of Energy and Environmental Protection, Hartford, CT)

**Abstract** - The onslaught of 3 consecutive years of *Lymantria dispar* (Gypsy Moth) defoliation coupled with extended drought and the eastward expansion of *Agrilus planipennis* (Emerald Ash Borer) has created innumerable public safety risks on State Agency properties, namely Department of Energy and Environmental Protection (DEEP) campgrounds, picnic areas, buildings, and parking lots. A variety of agency staff with various tree health assessment skills have geospatially documented and field marked over 15,000 trees that pose a high risk of causing harm were they to fall. Utilizing ESRI's 123 survey tool, DEEP can now make geospatially based priority decisions, direct contractors, and document progress alleviating these public safety hazards.

Sat-PM2-A-4

## **Distribution of Black Bears in the Exurbs and Suburbs of southern New York and Connecticut**

**Will Maynard** (Wildlife Technician Program, Mianus River Gorge, Bedford, NY) and **Budd Veverka** (Mianus River Gorge, Bedford, NY)

**Abstract** - Since 2011, increases in *Ursus americanus* (American Black Bear) population size and the southern expansion of their range in southern NY and CT (Westchester, Putnam, and Fairfield counties) has led to growing sighting and nuisance reports in these areas. As seen in the neighboring states of New Jersey and Pennsylvania, Black Bears are moving into areas of higher human development on the edge of their established range. As these Black Bear populations expand back into habitat once occupied in southern New England and southeast New York, they are filling into exurban and suburban habitats. We looked to map the change in distribution of Black Bears over time in the Hudson-to-Husatonic (H2H) Regional Conservation Partnership (RCP) area: Westchester County, NY, Putnam County, NY, and Fairfield County, CT. We also sought to determine what areas represented primary, secondary, and breeding habitat and to discriminate individual bears. Using noninvasive sampling methods (e.g., remote camera traps and sighting reports data), we determined the occurrence of Black Bears in the study area. Even during the relatively short time frame of the study, we observed expanding bear distributions and sows with cubs in areas they were not recorded previously. We compared the predictions of a set widely used habitat models to determine if these models adequately predicted bear distribution that we observed in suburban areas, and to generate hypothetical maps of where in the suburban/urban areas of the H2H region we might expect bears to occur in the future.

Sat-PM2-B-2

## **Native Earthworms and the Possible Pre-Columbian Earthworm Landscape of the Northeast**

**Timothy S. McCay** (Colgate University, Hamilton, NY)

**Abstract** - The earthworm fauna of previously glaciated North America is dominated by alien earthworm species, many of which are invasive and potentially harmful to native ecosystems. Nevertheless, there is growing evidence that a handful of native species are relatively widespread above the southern limit of glaciation. We sampled wetland habitats and compiled published and unpublished records to better understand the distributions and habitat associations of native species. The wetland taxa *Eisenoides* and *Sparganophilus* are relatively widespread in New York and portions of New England, though apparently restricted to habitats with saturated soils. Many sampled locations were relatively isolated, suggesting natural rather than anthropogenic dispersal. Preliminary morphological and genetic information suggests cryptic diversity within these taxa. The recently reclassified *Bimastos* (formerly *Dendrodrilus*) *rubidus* is widespread, but uncommon, in uplands of the Northeast, where it inhabits the leaf litter of forests. *Bimastos rubidus* is often found without other earthworm species in relatively remote locations, consistent with natural dispersal. Habitats with only *B. rubidus* had litter invertebrate communities similar to sites free of earthworms. We argue that naturalists should consider these native species as a part of the native natural heritage of the Northeast and that land managers should consider conservation policies to protect them from competition with exotic earthworms.

Sun-AM1-E-4

## Geographic Pattern in Earthworm Assemblages of the Northeast and Midwest

Timothy S. McCay (Colgate University, Hamilton, NY)

**Abstract** - Earthworm invasion in North America is dynamic and consequential. Peregrine species from Europe (Lumbricidae) dominate in many habitats, and Asian jumping worms (Megascolecidae) are spreading rapidly. This study of earthworm distributions, which originated in 2012, was one of the first expansion projects of the Ecological Research as Education Network (EREN). Sixteen collaborators have used a standard protocol to sample earthworms at 70 sites in 7 states. Earthworms were preliminarily identified, measured for length, and (in many cases) sent to a central repository (Colgate University) for final species determination and storage. Preliminary results suggest that population abundance and biomass of earthworms may be greater in previously glaciated forests of the Northeast and Upper Midwest than forests below the southern limit of glaciation. Northern sites were characterized by a greater abundance of *Lumbricus* spp., in particular, than sites farther south. Sampling can be easily done by students and within a typical lab period, which has facilitated participation at primarily undergraduate institutions. Broad collaborative networks are perfect tools for understanding active invasions, and invasive earthworms can illustrate many aspects of applied ecology in the classroom.

Sat-AM2-A-1

## HATCH: Partnering with Local Institutions to Bolster the Threatened Blanding's Turtle

Cara L. McElroy (Zoo New England's Grassroots Wildlife Conservation, Concord, MA), Bryan Windmiller (ZNEGWC, Concord, MA); Emilie Wilder (ZNEGWC, Concord, MA), and John Berkholtz (ZNEGWC, Concord, MA)

**Abstract** - Zoo New England's Grassroots Wildlife Conservation has been actively researching, managing, and protecting populations of the threatened *Emydoidea blandingii* (Blanding's Turtle) in Massachusetts since 2003. Our conservation management efforts include population health monitoring, habitat enhancement, nest protection, and headstarting. The latter process entails the temporary removal of offspring from the wild into captivity, where they are raised between 8 months and 2 years before being released back to their natal wetlands. Headstarting has proven effective in the augmentation of at-risk Blanding's Turtles by significantly increasing the survival rate of young juveniles. Currently, we headstart more than 130 hatchling turtles annually. Rather than doing so in a professionally maintained central facility, we recruit >2500 students and teachers annually at more than 25 schools to raise the turtles. Although this distributed method of headstarting requires a great deal of oversight and supervision on our part, the opportunities for conservation education that it affords us are invaluable. The turtles become an integral part of the classrooms—informing everything from persuasive essays to graphing exercises—and empower students to become lifelong stewards of their environment and the amazing biodiversity in their own backyards.

Sat-PM2-D-2

## Phylogeographic Analyses of Three Asian Earthworm Species Co-invading North America

Damnait McHugh (Colgate University, Hamilton, NY)

**Abstract** - Megascolecids are epigeic earthworms native to Japan and South Korea. Invasions by megascolecids species has been reported across the United States, and they are having noticeable negative impacts in hardwood forests. Co-invasion by 3 species (*Amyntas agrestis*, *Amyntas tokioensis*, and *Metaphire hilgendorfi*) has been reported in many locations. Individuals of each species grow quickly after hatching in spring and reach large sizes (>20 cm) by summer time; they all exhibit a surprisingly lively behavior when disturbed, which accounts for their common name, jumping worms. We are undertaking phylogeographic analyses of the 3 co-invading species using sequences from the mitochondrial gene cytochrome-c oxidase subunit I (COI) from worms sampled across their invasive ranges and their native habitats; we are also drawing on museum specimens to access historical data. Our goal is to understand whether these worms are becoming established through multiple, ongoing introductions, by jump dispersal within the US, or by dispersal along a leading front from an original southern introduction. We will discuss our results to date and our future plans for expanded sampling and finer-scale genetic analyses. Ultimately, we hope to understand the spread of megascolecids in the US, so that the impacts of these invasive species might be controlled.

Sun-AM1-E-1

## Techniques and Materials Used to Create an Effective Temporary Venomous Snake Exclusion Barrier

Kathy Michell (KT Wildlife, LLC, Narrowsburg, NY) and Tom Michell (KT Wildlife, LLC, Noxen, PA)

**Abstract** - Protection of herpetofauna during construction projects can be a challenge due to the cryptic nature of amphibians and reptiles that hide rather than flee like other wildlife. Regulatory agencies in the Northeast require the use of knowledgeable biologists to survey and monitor construction sites, such as linear utilities, for the presence of rare, endangered and threatened species and to safely remove them from the workspaces. The use of temporary exclusion barriers has become increasingly popular with project managers as a less expensive option to monitoring. However, the hardware cloth and silt fencing most commonly used are easily damaged, hard to maintain and generally fail, essentially creating traps for herpetofauna. Also, the project limits and access will determine whether exclusion fencing may be used successfully. If a project cannot be completely enclosed without access gates, fencing should not be an option. In 2019, the authors used 4-foot, high density polyethylene (HDPE) debris netting with 6 inches of soil cover on the ground, secured to steel T-posts by cable ties to create a *Crotalus horridus* (Timber Rattlesnake) barrier on an experimental project of 11.3 ha (28 acres) with a perimeter of 3.2 km (2 miles). The fence remained exclusive for rattlesnakes the entire active season even with breaches made by large mammal.

Sun-PM2-A-2

## Fruiting Phenology Investigated with Thoreau's Observations and Herbarium Specimens

Tara Miller (Boston University, Boston, MA), Richard Primack (Boston University, Boston, MA), Linnea Smith (German Centre for Integrative Biodiversity Research, Leipzig, Germany); and Amanda Gallinat (Utah State University, Logan, UT)

**Abstract** - Fruiting is an important life stage for plant reproduction and animal nutrition, but it remains an understudied area of phenology. In order to determine the most consistent measures of fruiting phenology and inform methodology in this field, we compared Henry David Thoreau's observations of fruiting in Concord, MA, to herbarium specimens of 67 species from across New England. We found that measures of first, peak, and last fruiting are correlated between the 2 datasets, indicating that there is a consistent sequence of fruiting. We also found that first, peak, and last fruiting are all highly correlated within each dataset, suggesting that it may be possible to collect robust fruiting data using any of these 3 measures.

Sat-PM1-C-2

## Phenological Shifts in Southeastern NY: Understanding the Local Effects of Climate Change through Analysis of a Unique Long-term Dataset

Megan Napoli (Mohonk Preserve, New Paltz, NY) and Natalie Feldsine (Mohonk Preserve, New Paltz, NY)

**Abstract** - As springtime temperatures progressively increase earlier in the season, environmental time-sensitive events such as migrating songbird arrival, amphibian over-wintering emergence/breeding, and flora emergence have been shifting to occur at earlier dates than previously observed. By studying these phenological relationships valuable insight is gained to understand the local effects of climate change. This case study investigates the usefulness of a unique long-term dataset monitoring phenology of bird arrival dates (1940–2018), amphibian emergence/breeding (1955–2018), and flora emergence (1928–2018) on the Mohonk Preserve, NY. The goal for this study was to determine if songbird arrival, amphibian calling and egg-laying, and flora emergence in spring had shifted to earlier dates over time in a localized area due to increasing annual springtime temperatures and changes in precipitation levels. We analyzed songbird arrival dates of 4 species: *Agelaius phoeniceus* (Red-winged Blackbird), *Pipilo erythrophthalmus* (Eastern Towhee), *Spizella pusilla* (Field Sparrow), and *Helmitheros vermivorum* (Worm-eating Warbler); anuran calling phenology in 2 species: *Lithobates sylvaticus* (Wood Frog) and *Pseudacris crucifer* (Northern Spring Peeper); egg-laying phenology in 2 species: Wood Frog and *Ambystoma maculatum* (Spotted Salamander); and flora emergence for 2 species: *Anemone quinquefolia* (Wood Anemone) and *Trillium erectum* (Red Trillium). To perform time-series analyses, we grouped phenology dates into 3 time-period categories of pre-, during, and post-anthropogenic emergence. We carefully digitized all records prior to 1991 from notecard observations into a database containing the other subsequent phenological observations. As predicted, our preliminary results indicate a significant ( $P \leq 0.05$ ) shift in songbird arrival, anuran calling, anuran and salamander egg-laying, and flora emergence to earlier dates. Although these preliminary analyses show promise that our dataset can be valuable at determining local phenological changes, more robust analyses with other variables are necessary to fully understand complete impacts on regional phenological events. Next analyzation steps include correlating phenology dates with average springtime temperatures and precipitation over time.

Sat-AM2-C-2

## Networking with YES! Youth Educational Seining Groups

**Kathleen A. Nolan** (St. Francis College, Brooklyn, NY)

**Abstract** - Seining (fishing with a 30-m net just offshore while wearing waders) is both a great way to engage people, especially students, in learning about their estuaries, as well as collecting important data about species such as abundance and diversity indices. We have found that urban teachers are not especially comfortable with introducing their students to seining, and so we have formed the YES! Youth Educational Seining interest group, which has gathered 3 times since 2013 to share our experiences and best practices with seining with youth. A fourth symposium is planned for Randall's Island on 11 June 2019. Many networking opportunities have resulted, and professional partnerships/ friendships have formed that have facilitated both additional students becoming exposed to seining and data mining, sharing, and analysis for ecological trends.

Sun-AM1-C-1

## Recovery Disparities in Island White-Footed Mouse Populations Following a Historically Snowy Winter

**Lauren Nolfo-Clements** (Suffolk University, Boston, MA) and Mark Clements (Northern Essex Community College, Haverhill, MA)

**Abstract** - The historically snowy winter of 2014–2015 had a significant impact on population densities of *Peromyscus leucopus* (White-Footed Mice) that have been monitored regularly on Bumpkin and Peddocks Islands in the Boston Harbor since 2008 and 2011, respectively. After the initial reductions experienced by both populations, the recovery on the 2 islands has not been uniform. While the mice on Bumpkin did not suffer as significant a population reduction initially, that population continued to decline the following summer and then began a significant increase in 2017 and 2018 back to near baseline levels. In contrast, the mice on Peddocks nearly underwent a localized extinction. That population has experienced a slow but steady increase since 2015 but still has not achieved the densities observed before the harsh winter. We attribute this difference to vegetative characteristics, the presence of other small-mammal species, and possibly predation pressure.

Sat-PM2-B-4

## Effect of Diurnal and Nocturnal Pollination on Fruit Abundance and Quality of Lowbush Blueberry (*Vaccinium angustifolium*) Patches on Kent Island

**Rachel Noone** (Bowdoin College, Brunswick, ME) and Patricia L. Jones (Bowdoin College, Brunswick, ME)

**Abstract** - Insect pollination is critical to the reproduction of many angiosperm species, including *Vaccinium angustifolium* (Lowbush Blueberry). As pollinator decline becomes more prevalent around the world, nocturnal pollination research is an area of increasing interest to the agricultural community. Our primary objective for this study was to assess the differences between diurnal and nocturnal pollination on Lowbush Blueberry patches on Kent Island, ME. We used mesh bags to control pollinator access to blueberry flowers. Experimental stems were each subject to 1 of 5 different pollination treatments: (a) left bagged continually during both nocturnal and diurnal hours with no exposure to pollinators (negative control), (b) bagged during only nocturnal hours (diurnal treatment), (c) bagged during only diurnal hours (nocturnal treatment), (d) left continually unbagged with full exposure to pollinators (positive control), or (e) left continually unbagged but bags were placed and immediately removed from stems once per day to control for the effects of bagging (sham control). The pollination exclusion bags were successful in preventing insect pollination of negative control stems. Fruit count, seed count, and total soluble solids to titratable acidity (TSS:TA) demonstrated how pollination and patch condition variations coalesce to influence fruit quality.

Sat-PM1-A-3

## ***Cypripedium arietinum*: Rare Plant Conservation in a Changing Climate**

**Andrea Nurse** (Climate Change Institute, University of Maine, Orono, ME)

**Abstract** - *Cypripedium arietinum* (Ram's-head Lady's Slipper) is a small, terrestrial, slipper orchid with a short rhizome and long, fibrous root system that spreads laterally within and immediately below the soil duff layer. Its current distribution range lies in a narrow climatic belt between 42° and 53° north latitude from Nova Scotia to Saskatchewan. There are 4 known sites where *C. arietinum* is found in Maine, with plant numbers and vigor notably declining at 2 of the sites. This is a successional plant with the most vigorous growth occurring under 30% canopy cover and, according to a study from Nova Scotia, Canada, with May and June soil temperatures  $\leq 25$  °C. Stands decline as canopy cover approaches 80% and disappear with prolonged shading. Preliminary soil temperature studies at the 4 sites with *C. arietinum* in Maine suggest increasing May and June soil temperatures. A 30-year demographic study at the New England Wild Flower Society site in Wayne, ME, further suggests that recent shifts in seasonality and warming soils will complicate management strategies for *C. arietinum* stands in the southern extent of their range.

Sun-PM2-D-3

## **How Do You Solve a Problem Like *Spiranthes cernua*?**

**Matthew C. Pace** (The New York Botanical Garden, New York, NY)

**Abstract** - The *Spiranthes cernua* species complex (Orchidaceae) is one of the most challenging of North American orchid groups, but it is also an exciting clade in which to examine patterns of (cryptic) northeastern diversity. Recently, continued molecular and morphological research into this complex has yielded very interesting discoveries, including species new to science. For those who are recently wondering “wait, what happened to *Spiranthes cernua*?”, this presentation will provide an overview of these changes, with guides to aid in identification.

Sun-PM2-D-4

## **Dispersal Distance by Sub-adult Herring Gulls Increases with Latitude Across the Gulf of Maine**

**Noah Perlut** (Department of Environmental Studies, University of New England, Biddeford, ME), **John Anderson** (College of the Atlantic, Bar Harbor, ME), **David Bonter** (Cornell Lab of Ornithology, Ithaca, NY), **Sarah Courchesne** (Department of Natural Sciences, Northern Essex Community College, Haverhill, MA), **Julie Ellis** (Department of Pathobiology, School of Veterinary Medicine, University of Pennsylvania, Kennett Square, PA), **Mary Everett** (University of Massachusetts Lowell, Lowell, MA), and **Peggy Friar** (Department of Biology, University of New England, Biddeford, ME)

**Abstract** - *Larus argentatus* (Herring Gull) is a long-lived colonial-nesting seabird, where first breeding generally occurs between the third and fifth year. Little is known about the movements and habitat selection of this species during the pre-breeding sub-adult phase. We studied off-colony resight locations of color-banded sub-adult Herring Gulls hatched on 3 colonies across the Gulf of Maine, where this species is in population decline. Our northernmost site, the largely undisturbed Great Duck Island, was 170 km NE of our roof-top nesting colony in Portland, which was 80 km N of the semi-disturbed colony on Appledore Island. In 2011–2019, we received resightings of 461 birds varying from 34 to 2572 days since banding (mean  $\pm$  SD = 555  $\pm$  492 days). The interaction between resight year and natal colony best explained variation in dispersal distance. Mean dispersal distance increased with latitude, where dispersal distances by Portland and Great Duck Island birds were 1.6 and 4.2 times, respectively, greater than birds hatched on Appledore Island. Nonetheless, while dispersal distances varied, the 3 populations generally overlapped along the East Coast of the United States; 61% of all observations were concentrated between the Delaware Bay and the New Hampshire coast.

Sun-AM1-B-3



## Community Farming for Grassland Birds: A Local Conservation Strategy

**Noah Perlut** (Department of Environmental Studies, University of New England, Biddeford, ME) and **Allan Strong** (Rubenstein School of Environment and Natural Resources, University of Vermont, Burlington, VT;)

**Abstract** - In the Northeast, nearly 100% of grassland habitat is privately owned, and the vast majority is devoted to agriculture. In much of the region, increased intensity of grassland management has been negatively associated with reproductive success and adult annual apparent survival of grassland birds, contributing to population declines. The success of future conservation depends on development of new strategies, including connecting the interests of landowners and managers directly with birds. In Vermont's Champlain Valley, *Dolichonyx oryzivorus* (Bobolink) and *Passerculus sandwichensis* (Savannah Sparrow) regularly return to breed on or near their natal field, regardless of management intensity. This philopatry enables us to follow individuals for multiple generations, providing rich life-history accounts. We searched for natal dispersers in a 20-km radius around 5 study fields (encompassing 174 fields and a total of 1763 ha) and used a community-based approach in collecting the data — integrating volunteers from Green Mountain Audubon and undergraduate students. Nearly all (98%) birds settled <3000 m from their natal site (Bobolink: mean = 1341 m, min–max = 0–8424,  $n = 201$ ; Savannah Sparrow: mean = 1263 m, min–max = 0–33,883 m,  $n = 136$ ). We shared accounts of Bobolinks and Savannah Sparrow lineages spanning up to 6 generations with local landowners and managers. The lineage data provide engaging stories to begin discussions about farming practices that balance production and grassland bird needs. Dispersal distance data helped frame the extent of management impacts; in this case, the decisions of a given landowner can affect the bird community within 3 km of their property.

Sat-AM2-E-4

## Alpine Sedges in the Northeastern Flora: Their Identity, Status, and Natural History

**Matt Peters** (Independent Botanist and Ecologist, Woodbury, VT)

**Abstract** - Only a small number of sedge species occur in alpine regions of the Northeast, and most are considered rare across part or all of their northeastern US range. This talk introduces these seldom seen components of our sedge flora. I offer updates on their population status and natural history based on my observations of them in conjunction with seed-collection efforts for the New England Wild Flower Society and botanical exploration in the alpine region of Uapishka, Quebec.

Sat-PM2-C-5

## Toward a Flora of Uapishka – Les Monts Groulx, Quebec

**Matt Peters** (Independent Botanist and Ecologist, Woodbury, VT)

**Abstract** - Uapishka or Les Monts Groulx, in north central Quebec, is the largest area of low-latitude alpine terrain in eastern North America, spanning an area nearly the size of Rhode Island. Despite relatively recent enhancements in accessibility, the area's flora remains incompletely known, and no published floras or checklists exist for this region. I made exploratory visits in 2017 and 2018 that yielded documentation of nearly 40 new taxa for the region, including disjunct arctic species and numerous calciphiles. In addition to these discoveries, the improved accessibility of online herbarium databases allows easier compilation of previously collected taxa. Thus, the time is right for a more thorough cataloguing of the flora of this important alpine region. The talk introduces the region, some of the significant botanical discoveries, and initial steps toward a flora of Uapishka.

Sat-AM1-C-4

## **Aquatic Ecosystem Stoichiometry in Response to Nutrient Deposition, Using the Model System *Sarracenia purpurea***

**Lindsey A. Pett** (University of Vermont, Burlington, VT) and Nicholas J. Gotelli (University of Vermont, Burlington, VT)

**Abstract** - Humans continuously alter nutrient cycles in the biosphere. These nutrient alterations can impact the use of freshwater systems for recreation and the provision of aquatic habitat for aquatic life. Yet, little is known how all compartments of an ecosystem respond to nutrient alteration. Some compartments may ameliorate nutrient imbalances. We used *Sarracenia purpurea* (Northern Pitcher Plant) and its obligate community of macroinvertebrates as a model aquatic ecosystem. Throughout the summer of 2018, we deposited different concentrations of nitrogen and phosphorus and nitrogen and phosphorus ratios into 38 pitcher plants in Molly Bog, VT weekly. After 11 weeks, we collected the ecosystem components of pitcher fluid, plant tissue, detritus, microbial community, phytoplankton, and diptera larvae. We enumerated and had the nitrogen and phosphorus content of those components analyzed. We found there is homeostatic regulation occurring at the pitcher fluid level. Our results also indicate the total phosphorus level in pitcher fluid correlates with abundance of *Wyeomyia smithii* (Pitcher Plant Mosquito) and *Sarraceniopus gibsoni* (Pitcher Plant Mite). N:P ratio was found not to impact functioning of the system in regards to biomass production.

Sat-AM1-C-3

## **Is Common Milkweed (*Asclepias syriaca*) Locally Adapted?**

**Aimee Phillippi** (Unity College, Unity, ME), Emily Mohl (St. Olaf College, Northfield, MN) and Andrew McCall (Denison University, Granville, OH)

**Abstract** - *Danaus plexippus* (Monarch Butterfly) populations have been on the decline since the mid-1990s. A variety of causes for the decline have been proposed, with habitat loss often being cited. As a result, intentional planting of milkweed species has been broadly encouraged, from government agencies to garden clubs. *Asclepias syriaca* (Common Milkweed) is a widely distributed species of milkweed in North America that is a primary food source for Monarch Butterflies and often planted to support butterflies. High levels of genetic variability, reduced pollen dispersal, and large capacity for vegetative reproduction via a rhizome are character traits that may contribute to local adaptation of Common Milkweed populations. If local adaptation exists in this species, then interbreeding with transplants may reduce fitness of native populations if transplants are not sourced locally. To test for local adaptation in Common Milkweed common garden transplant experiments are being conducted at 31 sites by college/university and high school instructors, led by researchers at St. Olaf College, and connected through the Ecological Research as Education Network (EREN). Data on germination, survivorship, growth, reproduction, and herbivory are being collected by cooperating researchers across the Northeast, Mid-Atlantic, and Midwest. Students at these sites are involved in the data collection and analysis, as well as learning about plant-insect interactions, evolution, conservation biology, and biological research through their participation and developed lesson plans.

Sat-AM1-A-4

## **Native and European Earthworm Assemblages along Riparian Zones in Eastern New York: 10 Years Later**

**Rebecca A. Pinder** (SUNY Columbia-Greene Community College, Hudson, NY)

**Abstract** - Earthworm assemblages along riparian zones located within the E.N. Huyck Preserve and Catskill State Park in eastern New York State were first investigated over a decade ago (2007–2008). It was determined at that time that riparian zones were hot-spots of earthworm biodiversity, with as many as 15 earthworm species along a single stream. Community structure was compared between the Catskill State Park and the E.N. Huyck Preserve and species assemblages varied by region. Vertical-burrowing (anecic) earthworm species and subsurface-tunneling (endogeic) species were disproportionately more abundant at E. N. Huyck Preserve than the Catskill State Park. The native *Eisenoides lonnbergi* and *Bimastos rubidus* were more prevalent in the Catskills, yet both regions hosted native earthworm species along riparian refugia at higher abundances than expected. The current study is on-going and seeks to compare patterns observed previously. Additional surveys thus far have confirmed previous earthworm assemblages and have found no significant change in relative abundance of earthworms per site. Additional native species, *Bimastos parvus* and *Sparganophilus eiseni*, were observed at the E.N. Huyck Preserve and are reflective of more comprehensive survey techniques rather than an indication of new arrivals. Over a decade after this research began, riparian zones still appear to be understudied hot-spots of earthworm biodiversity for native and European species. Increased monitoring of headwater habitats is encouraged, particularly due to the threat of the more invasive Megascolecid species that have been detected along larger streams and rivers in the area.

Sun-AM1-E-3

## **Presence of Metals in the Marine Macroalgae *Codium fragile* and *Chondrus crispus*: Establishing Baseline Data for the Bryant University Macroalgae Remediation Project**

**Steve Polak** (Department of Science & Technology, Bryant University, Smithfield, RI) and **Gaytha A. Langlois** (Department of Science & Technology, Bryant University, Smithfield, RI)

**Abstract** - Sediments and groundwater along the southern end of Prudence Island (site of a former fueling depot for the US Navy that was later remediated) are contaminated with residues of assorted petroleum products that continue to emerge in the intertidal zone. Such contaminants regularly contain heavy metals, and several seaweed species have been shown to concentrate these metals in their acquisition of nutrients and minerals needed for growth. Specifically, Ni, V, Cu, Cd, and Pb are normal constituents of crude oil. This study encompassed analysis of samples from an oiled site, as well as from a nearby uncontaminated site and allowed us to determine concentrations of Mg, Al, Ca, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Ba, and Pb in 2 sediment samples and 6 algal samples, as well as to explore the possible environmental risks posed by the petroleum residues seen in the area. Further studies could include the impacts on such heavy metal contamination due to increased water temperatures or changes in pH that may be associated with impending climate change effects.

Sat-AM1-D-2

## **Habitat for the Federally Endangered Northeast Bulrush: Searching in All the Wrong Places**

**Robert Popp** (VT Department of Fish and Wildlife, Barre, VT)

**Abstract** - The Vermont Natural Heritage Program has been monitoring and managing populations of the federally endangered *Scirpus ancistrochaetus* (Northeast Bulrush) for 25+ years. First we needed to find populations. Based on the type locality, program staff initially conducted extensive searches in backwater areas of the Connecticut River with no success. Only after we expanded our habitat image to include what was previously thought to be an anomalous occurrence in a mid-elevation beaver pond did we begin to find new populations. Up until 1993, only 2 populations were known in Vermont, but since then we have discovered 31 additional populations in 2 very different habitats: beaver flowages and vernal pools/perched shrub swamps. Through periodic monitoring of these populations we have learned that the Northeast Bulrush has a distinct life cycle in each of these habitat types. In the former setting, it can form extensive colonies consisting of thousands of culms, but which seem to disappear for extended periods, whereas in the latter setting it often persists for long periods in small numbers.

Sat-PM2-C-2

## **Twenty-five Plus Years of Monitoring and Management of the Federally Endangered Jesup's Milk-vetch**

**Robert Popp** (VT Department of Fish and Wildlife, Barre, VT)

**Abstract** - The Vermont and New Hampshire Heritage Programs have been monitoring the federally endangered *Astragalus robbinsii* var. *jesupii* (Jesup's Milk-vetch) for >25 years. It occurs at only 3 locations, all on ice and flood scoured outcrops along the Connecticut River. The Milk Vetch is a short-lived perennial, typically persisting for 3 years. During the interval from 1997 thru 2010, the populations fluctuated consistent with the plant's 3-year life cycle. However, in 2011 a significant drop was noted in all 3 populations. The decline has been attributed to high-water events in April and early May 2011 where a portion of the populations were under water for a number of days during the early growing season. There was likely further damage incurred from tropical storm Irene in August, which scoured the sites of all 3 populations, likely removing the seedbank and most seedlings. The 2 smaller populations failed to recover, and a decision was made to begin augmenting both populations. This effort has resulted in a slow, steady increase in the number of plants at these 2 sites, which begs the question of when to stop the augmentation. In addition, a decision was made to attempt to introduce new populations upstream of the historic stretch of river to avoid future impacts to all the populations from one catastrophic flood event.

Sun-AM2-D-3

## Was Thoreau a Good Naturalist?

**Richard B. Primack** (Boston University, Boston, MA) and Tara Miller (Boston University, Boston, MA)

**Abstract** - Henry David Thoreau is widely considered as one of the United States' greatest naturalists, and his detailed records are being widely used to determine the effects of climate change on the plants and animals of Concord, MA. The accuracy of his observations can be estimated by seeing how closely they compare with the observations of other Concord naturalists and by modern observations. Such data is available for flowering times, leafing out times, spring arrival times of migratory birds, and fruiting times. Where there is a lower degree of correlation of Thoreau's observations with other observers, we can consider such causes as the quality of the observations, different methodologies of data collection, changing populations sizes, and changing phenologies of individual species in response to climate change.

Sat-PM1-C-3

## From Golf Course to Wildlife Refuge: Quantifying Restoration Efforts with Low-cost Sensor Technology Using Stream Discharge and Turbidity

**Christa Reeves** (East Stroudsburg University, East Stroudsburg, PA), **Kristen Roth** (East Stroudsburg University, East Stroudsburg, PA), and Paul Wilson (East Stroudsburg University, East Stroudsburg, P)

**Abstract** - With natural landscapes becoming increasingly scarce, the issue of restoration is of the utmost importance. Abandoned agricultural land has been the traditional target of restoration efforts. However, due to shifting pastimes and economics, the popularity of golfing has declined resulting in golf course closures opening large tracts of land for restoration. Cherry Valley is a 78-ha (193-acre) parcel in the Pocono Plateau that is home to a large number of Federal Trust species, including 5 federally listed threatened or endangered species. Cherry Creek, which runs through Cherry Valley, drains into the Delaware River, providing drinking water for 15 million people. The quality of water that reaches the Delaware depends on healthy riparian corridors along its tributaries. As a golf course, the Cherry Valley site was stripped of natural vegetation and planted with ornamental/invasive species. This former golf course is now being restored as part of the Cherry Valley National Wildlife Refuge. Native vegetation is being replanted, and riparian corridors are being restored. We studied a control site with a well-protected woody wetland and an above average riparian zone at Aquashicola Creek for comparison to quantify change at Cherry Valley. We employed low-cost Mayfly data loggers along with periodic supplemental grab samples on both systems. Real-time monitoring, starting in May of 2017 for Cherry Creek and July at Aquashicola Creek, has allowed the parameters of discharge, temperature, conductivity and turbidity to be assessed both prior to, during, and following storm events. Using rainfall data provided by Hobo self-tipping rain buckets, we have been able to construct highly accurate hydrographs to depict discharge lag times on both the Aquashicola and Cherry creeks. Ecological change and restoration efforts are slow and difficult to assess, but as the restoration at Cherry Valley progresses, the long-term change can be quantified by using these 2 parameters.

Sun-PM2-C-6

## *Carphophis amoenus* (Eastern Wormsnake) in Massachusetts

**Alan Richmond** (University of Massachusetts, Amherst, MA)

**Abstract** - *Carphophis amoenus* (Eastern Wormsnake) has the most restricted range of any snake species in Massachusetts. It is known from sandy, loamy soils of southern portion of the Connecticut River Valley, with populations in Agawam, Springfield, East Longmeadow, Hampden and Wilbraham. While this species is relatively abundant in the southern part of its range, virtually nothing is known of its natural history in Massachusetts. Eastern Wormsnake is the smallest and most fossorial snake in the region. I monitored a population of Eastern Wormsnakes in Agawam, MA, from 2009 to 2016. The purpose of this project was to obtain as much information about the natural history of this species as possible. I distributed coverboard arrays of wood, slate or sheet metal were distributed throughout the study area in an effort to increase the possibility of finding animals. I captured a total of 16 Eastern Wormsnakes in 8 years. All animals were found between 0800 and 2000 hrs, under structure. I implanted PIT tags interperitoneally in large snakes and branded smaller individuals. I swept the area with a PIT-tag reader twice a week on average. Most of the animals would remain at the release site for 4–7 days and then disappear. Eastern Wormsnakes exhibited extreme fidelity to specific locations within their home ranges. The greatest distance moved was 44 m. Snakes spent most their time underground. They seemed to become active when soil temperatures were 14–18 °C (58–65 °F). Snakes were usually found during March–May or late August–October. Eastern Wormsnakes did not seem to tolerate repeated disturbance. Once captured and marked, the animals were not found above ground again.

Sun-PM2-A-4

## **Ocean Sunfish Strandings on the Shores of New England**

**Michael A. Rizzo** (NECWA, Middleborough, MA), Carol D. Carson (NECWA, Middleborough, MA), and Tammy L. Silva (UMass Dartmouth, North Dartmouth, MA)

**Abstract** - *Mola mola* (Ocean Sunfish) is a coastal pelagic fish and the heaviest bony fish in the world. Each summer and fall, Ocean Sunfish move into coastal waters off New England to feed. As fall approaches, Ocean Sunfish begin migrating south to warmer waters. Unfortunately, a number of fish will become trapped inside Cape Cod Bay, unable to navigate out of the bay and continue their migration south. These individuals will become cold-stunned, a condition to prolonged cold water, and will wash ashore dead. Since 2008, the New England Coastal Wildlife Alliance has responded to Ocean Sunfish strandings throughout New England. Stranding season typically begins in early September and continues through December, with the majority of strandings occurring in October and November. Most strandings occur on the northern shores of Cape Cod, but can be as far north as Rye, NH, or as far south as Nantucket, MA. Stranding hotspots on Cape Cod occur along the shores of Wellfleet and continue south to Brewster, which are common stranding locations for other marine wildlife, including sea turtles, sharks, and dolphins. In 2008, 6 Ocean Sunfish strandings were documented, and the number of strandings increased each year until 2012 with 39 reported strandings. However, there was a dramatic decline in 2013, with only 8 documented strandings. After 2013, there was a consecutive yearly increase in documented strandings in each of the following years, peaking in 2017 with 79 stranded fish. Standard protocol for strandings involves collecting site information, taking photographs, and tagging carcasses to prevent over counting. If environmental and carcass conditions are favorable, we conduct internal and external examinations, as well as collect various tissue and organ samples. Carcasses have varied in size from 98.6 cm to 233.0 cm TL (mouth to end of clauvus) and weights from 50.8 kg to 484.0 kg. None of the carcasses have shown evidence of sexual maturity, and we do not have a reliable method of ageing them at this time. Samples and data collected from necropsies are shared with researchers to support their work in finding methods to age these animals.

Sat-AM1-D-3

## **Predicting the Spread of Spotted Lanternfly (*Lycorma delicatula*) in Central Massachusetts**

**John Rogan** (Clark University, Worcester MA), and Arthur Elmes (UMass Boston, Boston MA)

**Abstract** - *Lycorma delicatula* (Spotted Lanternfly) is an exotic pest to the Eastern US that can deleteriously impact >70 woody plant species. It is likely that this species will have an impact on the woodlands, urban tree canopy, and commercial nursery stock in Central Massachusetts; however, little is currently known about the locations that are at greatest risk to infestation. To address this knowledge gap, a map of Spotted Lanternfly invasion potential was created using a species-distribution modelling approach that included the mapped distribution of *Ailanthus altissima* (Tree-of-heaven), a likely host of Spotted Lanternfly. The results of the species models indicate that major junctions for transportation routes would serve as hubs for infestation and spread to local orchards and nurseries (with a minimum of 20 orchards at direct risk in the study area).

Sat-PM1-B-3

## **Engaging Broader Audiences through the iMapInvasives Certified Trainers Network**

**Brittney Rogers** (SUNY ESF, Syracuse, NY)

**Abstract** - Train-the-trainer approaches in citizen science provide opportunities to reach a wider and more engaged audience. Trainers have more direct access from within a community and have a better understanding of the goals or issues affecting their stakeholders. Through the New York Natural Heritage Program and the SUNY College of Environmental Science and Forestry, iMapInvasives has developed and is currently implementing a successful Certified Trainers Network by training and retaining volunteer instructors across New York State. The idea of the train-the-trainer model is essential to building on this overall citizen science program, and our goal is to not only improve collaboration and networking, but to further create a more sustainable project.

Sun-PM2-C-4

## **Adirondack Orchid Survey: Species, Distribution, and Abundance**

**Tierney R. Rosenstock** (NYS DEC, Albany, NY)

**Abstract** - A systematic and comprehensive inventory of the orchid species of the Adirondacks has never been attempted even though 50 of the 68 known taxa in New York have been recorded within the Adirondack Park boundary. A survey using professional biologists and citizen scientists entering information into iNaturalist was begun in the summer of 2017. The primary purpose of the survey effort has been to record baseline data on the number, locations, and abundance of orchids and gather natural history information to fulfill several survey goals within the Adirondacks. The presentation will highlight the accomplishments and discoveries of the past 2 years of the survey effort.

Sun-PM2-D-1

## **Phenological Changes in Avian Migration Revealed by Local Long-Term Data From Northeast Connecticut**

**Sarah E. Rumsey** (University of Connecticut, Storrs, CT), **Morgan W. Tingley** (University of Connecticut, Storrs, CT), and **Andrew N. Stillman** (University of Connecticut, Storrs, CT)

**Abstract** - Long-term ecological datasets are rare but extremely valuable for understanding how the world has changed given the onset of global change. In particular, systematic observations repeated over years by amateur naturalists can inform long-term trends on ecological processes that are both gradual and show high inter-annual variation. Here, we present a dataset donated to the University of Connecticut containing daily observations of birds at the present-day Boyd Woods Audubon Sanctuary, collected over a span of 31 years. From 1956–1987, a time when Connecticut residents began witnessing the effects of industrialization on the state's wildlife, Margerey Boyd dedicated some time every day to conducting a survey of bird species on her property. We have taken these hand-written records, containing over 450,000 individual bird records, and completely digitized and proofed them. We then evaluated these 30 years of records for changes in arrival and departure dates of neotropical migrant birds. Despite only moderate warming during this period—relative to modern rates—the Boyd records show phenological shifts in migration timing on a species-by-species basis. Given the unusual existence of these mid-20<sup>th</sup>-century ecological records, the Boyd bird sightings offer rare insight into the beginnings of global change through real-life historical data.

Sat-AM2-C-3

## **Macroscale Ecology in the Classroom: An EREN Partnership Using NEON Data**

**Sara E. Scanga** (Utica College, Utica, NY), **Diane Styers** (Western Carolina University, Cullowhee, NC), **Laurel J. Anderson** (Ohio Wesleyan University, Delaware, OH), **Kristen Brubaker** (Hobart and William Smith Colleges, Geneva, NY), **Mary Beth Kolozsvary** (Siena College, Loudonville, NY), **Jennifer L. Schafer** (Winthrop University, Rock Hill, SC), **David Barnett** (Battelle Memorial Institute, Boulder, CO), **Jose-Luis Machado** (Swarthmore College, Swarthmore, PA), **Michael Madritch** (Appalachian State University, Boone, NC), and **Jessica Mitchell** (University of Montana, Missoula, MT)

**Abstract** - Since its inception in 2010, the Ecological Research as Education Network (EREN) has formed several partnerships with other organizations. A new partnership, the “JEN” (Joint-EREN-NEON) project, exemplifies how EREN can be tied into requirements of grants for broader impacts, linking the expertise and needs of researchers from research-focused and primarily undergraduate institutions (PUIs). The objective of the JEN project is to develop classroom materials that build undergraduate students' knowledge of macroscale ecology-related concepts, along with data management and spatial-analysis skills using regional- to continental-scale data sets. The classroom materials include lectures and hands-on activities that teach students how to use freely available vegetation data from the National Ecological Observatory Network (NEON) to investigate large-scale patterns in biodiversity across the eastern United States. The hands-on activities were developed along 2 tracks: an introductory track that teaches Excel spreadsheet skills, and an advanced track that expands to teaching R and GIS skills. The JEN team produced these classroom materials together in the summer of 2018, following a workshop that included participants from PUIs, research-focused universities, and NEON. In the Fall 2018 semester, the classroom materials were used in a wide variety of courses taught by JEN faculty at 6 different PUIs, reaching over 100 undergraduates. A 10-question multiple-choice quiz was administered to the students before and after the classroom activities to evaluate their learning of concepts related to macrosystems, spatial scaling (e.g., species-area curves, nested plot sampling), and the calculation of several diversity metrics (e.g., alpha, beta, and gamma diversity), as well as their familiarity with NEON. Students also evaluated their own knowledge of these concepts and their skill levels in Excel, R, and GIS before and after the classroom activities. Preliminary observations indicate that student knowledge and skills improved in some, but not all, areas. Developing the classroom materials as a team was a sometimes challenging but ultimately productive process, and the strengths and weaknesses of our approach will be discussed. Going forward, the JEN team plans to develop additional classroom materials that will allow students to use remotely sensed NEON data to investigate macroscale biodiversity patterns.

Sat-AM2-A-3

## Individual Variation in Foraging Behavior by Gulls in Eastern Maine

Jenna Schlener (Island Research Center, College of the Atlantic, Bar Harbor, ME)

**Abstract** - Great Duck is an 89-ha (220-acre) island in the Gulf of Maine and is one of the larger breeding gull colonies in the Northeastern United States. *Larus argentatus* (Herring Gull) is a notoriously generalist and opportunistic feeder that utilizes a broad range of prey types within a variety of habitats. In order to better understand the variation in selection for foraging sites in the population on Great Duck, I placed 8 Ecotone Harrier GPS tags on incubating adult Herring Gulls and tracked their movement from mid-incubation through fledging (May through August). Three out of the 8 adults tagged had nests where no chicks hatched, but the birds continued to return to the breeding colony. The daily behavior of adults with chicks and without chicks were distinctly different. Adults without chicks took fewer foraging trips per day, but these trips were of longer duration and went further from the colony than the foraging trips of adults with chicks. The results also showed that each tagged adult displayed a high degree of preference for specific foraging locations. Some birds were much more likely to be located near potential anthropogenic food sources on land, while others favored the intertidal, or appear to have been following lobster boats at sea. This effort is the beginning of a long-term study into how individual variation in foraging behavior and location affects reproductive success.

Sun-AM1-B-2

## Effects of Japanese Barberry on the Prey Base and Physiological Condition of Breeding Male Ovenbirds

Chad L. Seewagen (Great Hollow Nature Preserve & Ecological Research Center, New Fairfield, CT) and Susan Smith Pagano (RIT, Rochester, NY)

**Abstract** - *Berberis thunbergii* (Japanese Barberry) is one of the most widespread and invasive plants in many forested regions of eastern North America and yet little is known about its impacts to wildlife. We examined the effects of Japanese Barberry on habitat quality for forest-breeding songbirds by comparing prey abundance (leaf-litter arthropod biomass) and the physiological condition of territorial male *Seiurus aurocapilla* (Ovenbird) between areas of a New York State forest that have a high density of Japanese Barberry and those that have an understory composed of mostly native vegetation. We used a suite of hematological condition indices that included hematocrit volume, hemoglobin concentration, and plasma triglyceride concentration as indicators of energetic condition, plasma uric acid concentration and total plasma protein levels as indicators of diet quality, and heterophil:lymphocyte ratio as an indicator of chronic stress. Arthropod abundance and species richness were significantly lower in the leaf litter around dense clusters of Japanese Barberry than in areas with little to no Japanese Barberry present, but overall biomass did not differ. As unselective, generalist insectivores, food abundance for Ovenbirds was therefore unlikely affected by Japanese Barberry. This conclusion was reflected by the hematological condition indices, none of which differed between Ovenbirds with high or low densities of Japanese Barberry in their nesting territory. We also found no difference in body mass, body size, or age ratio to indicate that the areas with little to no Japanese Barberry were in higher demand or more difficult to acquire. While our results suggest that Japanese Barberry does not diminish habitat quality for breeding male Ovenbirds in a way that affects their food source or physiological condition, we caution that it could still ultimately impact fitness by other potential means, such as contributing to conditions that result in increased nestling or adult predation. Combating Japanese Barberry on a large scale is extremely labor-intensive and costly for land managers, and so the effects of this non-native plant on wildlife need to be better understood before allocating limited conservation resources to its eradication.

Sun-AM2-B-2

## Secondary “Market” for Bird Feathers: What Happens to Feathers After Birds Shed Them?

**Daniel P. Shustack** (Massachusetts College of Liberal Arts, North Adams, MA)

**Abstract** - Every year billions of birds shed and replace trillions of feathers. Yet these dropped feathers do not build up in the environment. This is a peculiar observation given that feathers are composed primarily of keratin, a tough and decay-resistant protein. I conducted a series of experiments to evaluate the fate of shed feathers under natural conditions. First, I placed flight feathers of *Dumetella carolinensis* (Gray Catbird) and *Bombycilla cedrorum* (Cedar Waxwing) in litter bags for ~2 years on the forest floor in Western Massachusetts. Litter bags eliminated feather removal and gnawing by rodents, Trogid and Dermestid beetles, and Teinid moths. While a few feathers were mostly decomposed over these 2 years, some remained remarkably intact, and overall, mass loss was negligible (~2%;  $P = 0.4$ ). Second, I tethered flight feathers from *Strix varia* (Barred Owl) to the forest floor without the protection of litter bags. The feathers remained largely intact after 12 months, but most of the feather was gone by 20 months, except the calamus which was tied to the fishing line. Third, I placed trail cameras in front of piles of feathers and individually tethered feathers. Most animals detected on the trail cameras ignored the feathers. However, a few rodents (*Tamias striatus* [Eastern Chipmunk], *Sciurus carolinensis* [Gray Squirrel], and *Peromyscus* [deer mice]) were detected (<5% of observations) gnawing on the feathers. I failed to detect Trogids with these previous methods, so I attempted to lure Trogids to bird carcasses. I successfully captured many Trogids in pit-fall traps over the ~4-month decomposition period.

Sat-PM2-E-5

## Controlling Lily Leaf Beetle: An Integrated Pest Management Approach

**Paul Siskind** (Master Naturalist, Norwood, NY)

**Abstract** - *Lilioceris lili* (Lily Leaf Beetle) is a Chrysomelid that feeds almost exclusively on aerial parts of bulbous *Lilium* spp. (lilies) and *Fritillaria*. Native to temperate Eurasia, it was first documented in North America in 1943, in Montreal, ON, Canada. A second infestation was documented in 1992, in Cambridge, MA. The beetle has since spread across the northern US and southern Canada to the Pacific coast, with the northeastern US and eastern Canada remaining heavily infested. It infests both non-native *Lilium* hybrids in gardens as well as native *Lilium* species. There are no known natural predators of the beetle in North America. Three species of parasitoid wasps (*Tetrastichus setifer*, *Lemophagus errabundus*, and *Diaparsis jucunda*) have been imported from Europe and released in the Northeast since 1999. However, the extent of the beetle infestation far outpaces the spread of the parasitoids, posing a threat to native lily populations. Because of this, I have developed an integrated pest management approach to potentially control infestations of the beetle in ornamental gardens, to lessen the severity of their impact on native lilies until the imported parasitoids have become more thoroughly established throughout North America. Several methods of physical and chemical control were tested to determine their effectiveness during different phases of the beetle's life cycle, and I propose a protocol that maximizes their effectiveness while minimizing collateral impact and risk of resistance. I will discuss additional observations about unexpected late-season mating behavior and oviposition, which potentially indicate a departure from the reported univoltine life cycle and might have important implications regarding the beetle's invasive potential in North America.

Sat-PM2-E-1



## **Larval Development Variation Exhibited by Wood Frogs from Across New England Including Mount Washington, NH**

**Scott Smyers** (Oxbow Associates, Inc., Boxborough, MA)

**Abstract** - *Lithobates sylvaticus* (Wood Frog) is a common and ubiquitous species across the forested landscape of New England and breeds and deposits eggs in seasonal ponds. The ecological setting of each pond is unique, and hydroperiod, geology, topography, vegetative cover, and exposure to wind or open sky (direct sun) are all important variables to the biological community affecting available nutrients and potential predators in the ponds where tadpoles are developing. Two ponds (Lakes of the Clouds) on Mount Washington in the White Mountains of NH represent the extreme limits of seasonal restrictions to amphibians in our region. Even when conditions are favorable earlier, amphibian breeding and egg laying does not occur until the first week of June. Both ponds are permanent, above treeline, and do not contain fish, but have very different larval-development periods for Wood Frogs. In the shallower pond, metamorphosis normally occurs in September after 90 days or more in 1 pond. In the deeper pond, I have not observed any metamorphosis of any Wood Frogs on any year. In contrast, Wood Frogs from southeastern Massachusetts often breed in March and undergo metamorphosis in June after 60–90 days. I will explain some important methods demonstrating the value of digital photography and image analysis to minimize the need for destructive sampling in sensitive areas. I will present results comparing body size at metamorphosis and larval period between populations and discuss hypotheses on why Wood Frogs are 2.15x heavier (mass) and 1.42x longer (total length) near the top of Mount Washington compared to a forest in southeastern MA. I will give examples of how weather patterns can affect amphibian development and provide 2 cases from Mount Washington: (1) in 2016, an unusually dry summer did not affect metamorphic timing or size (negatively); and (2) in 2017, an unusually cloudy summer (but not significantly cooler) delayed the larval period and prevented annual juvenile recruitment of Wood Frogs from a normally predictable population. These unusual seasons provide important data and offer insights into the life-history pathways of each population justifying long-term studies of common amphibians including those inhabiting extreme ecological settings.

Sun-AM2-A-4

## **Species' Forest Model for the Return of the Natural Landscape**

**Richard H. Stafursky** (Species Forest, Inc., Shelburne, MA)

**Abstract** - A natural landscape research model developed by Species Forest, Inc., begun in 2001 and located on a 32-ha (80-acre) former dairy farm in Conway, MA, demonstrates how culturally managed acres can revert to the sole control of natural forces and processes by first identifying aspects of the cultural landscape, by removal of these cultural landscape elements and then adhering to measures for the protection in perpetuity of the natural landscape. I propose that (1) any acreage near the center of the Great Northeastern Broadleaf Forest of New England can be returned to a natural state—perhaps not exactly as if the cultural management had never happened, but a truly natural landscape nonetheless—and (2) the consideration of all the other plant, animal, fungi and soil microbe species as original forest occupants is important in effecting the reversion of forest land to a natural state.

Sat-PM2-A-1

## **The Diversity, Evolution and Ecology of *Carex*: a Personal Perspective**

**Lisa A. Standley** (New England Botanical Club)

**Abstract** - This presentation will focus on the large genus *Carex* in New England, and my personal interest and research. I'll discuss *Carex* from an evolutionary and ecological perspective, touching on how *Carex* is defined, how species are organized in a taxonomic and phylogenetic hierarchy, the history of *Carex* research in New England, and highlights of the diversity of the genus in New England. With examples from my research and the work of others, I'll discuss problems in speciation, ecology, rarity, and the implications of climate change.

Sat-PM2-C-1

## Signaling from Below: Rodents Select for Deeper Fruiting Truffles with Stronger Volatile Emissions

**Ryan B. Stephens** (University of New Hampshire, Durham, NH), Amy M. Trowbridge (Montana State University, Bozeman, MT), Andrew P. Ouimette (University of New Hampshire, Durham, NH), W. Berk Knighton (Montana State University, Bozeman, MT), Erik A. Hobbie (University of New Hampshire, Durham, NH), Paul C. Stoy (Montana State University, Bozeman, MT), and Rebecca J. Rowe (University of New Hampshire, Durham, NH)

**Abstract** - Many plant and fungal species use volatile organic compounds (VOCs) as chemical signals to convey information about the location or quality of their fruits/fruited bodies to animal dispersers. Identifying the environmental and biotic factors that shape fruit selection by animals is key to understanding the evolutionary processes that underpin chemical signaling. Using 4 *Elaphomyces* truffle species, we explored the role of fruiting depth, VOC emissions, and protein content in selection by 5 rodent species. We used stable isotope analysis of nitrogen ( $\delta^{15}\text{N}$ ) in truffles and soil to estimate fruiting depth, proton-transfer-reaction mass spectrometry to determine volatile emission composition, and nitrogen concentrations to calculate digestible protein of truffles. We coupled field surveys of truffle availability with truffle spore loads in rodent scat to determine selection by rodents. Despite presumably easier access to the shallow-fruited species, *E. americanus* and *E. verruculosus* (1.5 and 3.6 cm below the soil surface, respectively), most rodents selected for *E. macrosporus* and *E. bartlettii* that fruited deeper in the soil (5.9 and 8.6 cm, respectively). These deeper-fruited species had distinct VOC profiles and produced significantly higher quantities of odiferous compounds. However, *Myodes gapperi* (Southern Red-backed Vole), a fungal specialist, selected for the truffles with high levels of digestible protein, *E. verruculosus* and *E. macrosporus*. Our results highlight the importance of chemical signals in truffle selection by rodents and suggest that VOCs are under strong selective pressures relative to protein rewards. For truffles, strong chemical signals likely allow detection by rodents deep within the soil where fruiting conditions are less influenced by drought or freezing. Strong chemical signals of truffles likely increase detection and reduce foraging effort by rodents, irrespective of fruiting depth. However, for species that depend on fungi as a major food source, protein content may be more important than fruiting depth and VOC emissions.

Sun-PM2-E-4

## Parental Behaviors Mediate the Effects of Bird Blow Fly Parasitism on Nestlings in Suburban Forests

**Katherine (Kit) Straley** (University of Massachusetts, Amherst, MA), Paige S. Warren (University of Massachusetts, Amherst, MA), and David I. King (USDA Forest Service, Amherst, MA)

**Abstract** - Suburban ecosystems provide unique opportunities to study how an animal's behavior responds to novel habitat changes. A major outstanding question is whether birds have the behavioral flexibility to adaptively respond to the conditions they experience in developed landscapes. Urbanization influences species interactions, including host-parasite interactions. Using *Hylocichla mustelina* (Wood Thrush), a declining songbird, we examined (a) whether suburban birds experience different ectoparasite loads, and (b) if parental behavioral decisions will mediate the impacts of ectoparasites on nestling health. In particular we compared the abundance of *Protocalliphora* (bird blow flies) from the nest, measurements of nestling condition, and parental behaviors monitored via nest cameras from suburban forest fragments and a larger forest. Preliminary analyses indicate that suburban nestling body condition was not affected by the presence of bird blow flies, while rural nestlings experienced a decrease in body condition when parasitized. Parents nesting in suburban sites provisioned nestlings at higher rates across multiple age classes, allowing the suburban nestlings to maintain body condition while parasitized. Our results suggest that suburban birds are indeed flexible in their parental behavior, and this may be due to greater abundance or higher quality of food resources or predator relaxation in suburban forest fragments.

Sat-PM2-B-6

## Effects of Riparian Plant Invasions on Stream Macroinvertebrate Communities

Weston Strubert (East Stroudsburg University, East Stroudsburg, PA) and Emily Rollinson (East Stroudsburg University, East Stroudsburg, PA)

**Abstract** - Leaf litter from riparian plants is an important source of nutrients for stream macroinvertebrates. Riparian zones are highly susceptible to plant invasions, and changes in the species composition of riparian habitats may lead to substantial changes in the quality of leaf-litter inputs to streams. We conducted a field experiment examining decomposition rates and macroinvertebrate colonization of leaf-litter packs in 4 streams in northeastern Pennsylvania: Brodhead Creek, Appenzell Creek, Cherry Creek and Bush Kill. Mixed-species leaf-litter packs representing native plant communities contained leaves from *Rhododendron maximum* (Rosebay Rhododendron) and *Acer rubrum* (Red Maple), while invasive litter packs comprised *Acer platanoides* (Norway Maple) and *Fallopia japonica* (Japanese Knotweed). Single-species leaf packs were also prepared for each species. Leaf-litter packs remained in the stream riffles for 2 months, to allow macroinvertebrates to colonize the packs and begin decomposing the leaves. We collected half of the leaf packs after 1 month and the other half after 2 months. We weighed the remaining leaf matter and identified all macroinvertebrates to the family level. Decomposition rates were significantly different between invasive and native leaf packs. Macroinvertebrate count was significantly greater in native mixed-species packs than that of invasive mixed-species packs. These findings suggest that stream macroinvertebrates might prefer a mix of native riparian species' leaves to that of colonized invasives. With this information, monitoring riparian zones for future colonization by invasive plant species will be beneficial in sustaining stream macroinvertebrate communities.

Sun-AM2-C-3

## Movements, Home Ranges, and Seasonality in Habitat Use by Northern Copperhead in Massachusetts

Tigran Tadevosyan (Oxbow Associates, Inc., Boxborough, MA), Brian O. Butler (Oxbow Associates, Inc., Boxborough, MA), Scott Smyers (Oxbow Associates, Inc., Boxborough, MA), Gregory A. Mertz (New England Wildlife Center, Weymouth, MA), Ronald Strohsahl (Oxbow Associates, Inc., Boxborough, MA), Jonathan Shuster (Oxbow Associates, Inc., Boxborough, MA), Kyle Cormier (Oxbow Associates, Inc., Boxborough, MA), Robert Adamsky (New England Wildlife Center, Weymouth, MA), Lisa Trout (New England Wildlife Center, Weymouth, MA), and Andrea Agostino (National Grid, Waltham, MA)

**Abstract** - We aimed to understand peculiarities in spatial ecology and seasonality in habitat utilization in *Agkistrodon contortrix mokasen* (Northern Copperhead), a Massachusetts State endangered species, at the northern and eastern limit of its range. We implanted 23 individuals from 4 hibernacula with radio-transmitters, radio-tracked snakes for 1 season (April 2017–April 2018), and recorded actual and/or triangulated locations using hand-held GPS. Three males were predated (one after being tangled in the 3/4-inch vinyl netting at a residential property); each event was scattered in space and time. We found that the duration of the active season was 33 weeks (10 April 2017–25 November 2017) and used geographic information system (GIS) to create activity-zone maps. Unlike other studies, we revealed no significant differences in either movement distances ( $P = 0.77$ ) or home range sizes (100% minimum convex polygon [MCP];  $P = 0.57$ ) between sexes. However, similar to other studies, males ( $n = 11$ ) had larger activity ranges than females ( $n = 7$ ) in June ( $P = 0.027$ ) and August ( $P = 0.029$ ). In October, females that did not reproduce that year made longer movements than males ( $P = 0.006$ ). Two postpartum females expanded activity ranges in fall for foraging, and returned to their hibernacula last. We compared gain curves of 8 eco-geographical variables (slope, topographic position index, average monthly solar radiation, distance from forest, distance from wetlands, distance from grasslands, distance from settlements, distance from major roads) and patterns of the relative occurrence rate (ROR) between months using a multivariate maximum entropy model (Maxent). From September to April during ingress, hibernation, and egress, ROR was predicted primarily by high solar radiation (contribution = 36.2%) and distance from settlements (contribution = 23.4%), whereas from June to early September (the period of foraging, mating, and gestation) ROR was predicted best by the proximity of anthropogenic grasslands (contribution = 18.8–52.3%) and shrub-wetlands (contribution = 7.3–15.8%). Gravid females used hilltops during gestation and birthing. We propose selective clearing of wooded areas to increase suitable summer foraging habitat, while decreasing the risks associated with habitat utilization where anthropogenic alteration and use is most concentrated along the periphery of the protected land.

Sun-PM2-A-5

## **Minimal Impact of a Long-Distance Hiking Trail on the Plant Community in the Adirondacks**

**Jack T. Tessier** (SUNY Delhi, Delhi, NY)

**Abstract** - Hiking trails provide the opportunity for people to access, experience, and appreciate natural areas. These trails also pose the risk of damage to those ecosystems by converting forest area to trail, providing the opportunity for off-trail hiking, disrupting canopy cover, and increasing soil compaction. To assess the impact of hiking trails on the plant community of a forested ecosystem, trail width was recorded and understory vegetation were measured at the trail edge, 3 m from the trail, and 5 m from the trail every 4 km along the Northville-Placid Trail from Benson to Averyville Road in the Adirondack State Park in August 2018. Soil compaction, canopy cover, and the tree species in the canopy were documented at the mentioned sample locations and in the trail itself. The mean trail width was  $65.18 \pm 6.06$  cm. Within the 183.39 km of trail sampled,  $119,533.60 \pm 11,113.43$  m<sup>2</sup> of forest was replaced with trail. None of the canopy species was more likely to be sampled away from the trail versus adjacent to or above the trail. Canopy cover did not differ significantly among sample locations. Soil compaction was greatest in the trail and significantly lower off the trail. Cover near to or away from the trail was not significantly different for any of the understory species. Understory community composition was more similar among plots within a location than between 5-m plots of adjacent sample locations. Collectively, the forest ecosystem outside of the trail itself is not significantly affected by the presence of the trail. The major impact of the trail is replacing the plant community with the width of the trail. Hikers should be educated and encouraged to use trails in ways that minimize the width of the trail to protect the ecosystem.

Sat-PM2-A-2

## **Amphibian Road Closures: Lessons Learned From a Pilot Season of “Big Night Detours” in Keene, NH**

**Brett Amy Thelen** (Harris Center for Conservation Education, Hancock, NH) and **Duncan Watson** (City of Keene, Keene, NH)

**Abstract** - Amphibian road mortality is a considerable conservation issue, particularly during the highly synchronized annual spring migrations (“big nights”) undertaken by vernal pool-breeding species in the Northeast. Observed road mortality rates along even low-traffic rural roads may be high enough to lead to localized extirpation of pool-breeding amphibians, and long-term impacts of roads on amphibian population dynamics can be severe. To reduce road mortality of local amphibians, the Harris Center for Conservation Education—a non-profit organization based in the Monadnock Region of southwestern New Hampshire—coordinates an annual “Salamander Crossing Brigade” program, in which trained volunteers move migrating amphibians across roads by hand during periods of peak traffic. In 2018, following 10 years of crossing brigade efforts at North Lincoln Street in Keene, NH, the City of Keene agreed to close the road to vehicle traffic on “big nights”. To our knowledge, Keene is the first community in New Hampshire to institute road closures for the protection of migrating amphibians. In this talk, we’ll outline how the Harris Center and City of Keene worked together to turn citizen science data into on-the-ground amphibian conservation, and share lessons learned from our first season of road closures.

Sun-AM1-A-1

## Breeding Grassland Bird Presence in Southeastern Massachusetts

**Teresa T. Trias** (Wheaton College, Norton, MA), **Doug Williams** (Mass Audubon Stony Brook Wildlife Sanctuary, Norfolk, MA), and **Jessie L. Knowlton** (Wheaton College, Norton, MA)

**Abstract** - Climate change, coupled with habitat loss due to urbanization and disturbance of breeding grounds by anthropogenic activities, poses a threat to migratory birds that use Massachusetts grasslands as breeding grounds. The purpose of this study was to identify the presence, abundance, and habitat use of breeding grassland birds in areas disturbed by anthropogenic activity and to recommend conservation strategies to the land managers of these areas. Protecting grassland habitats for breeding birds while at the same time allowing for continued human use would benefit both groups, as it would provide educational opportunities to make people more aware of the birds at risk and how their actions on grasslands can impact these species. This study was conducted at 3 locations in southeastern Massachusetts that were suspected to have supported breeding grassland birds in the past, but are currently regularly used for human recreation or hayed during the summer months: Leland Wild (the former Norfolk Airfield), the Wrentham Developmental Center, and the Town of Wrentham Rice Recreation Area. We set up a total of 15 semi-permanent point-count circles at the 3 locations and censused them 3 times between 24 June and 1 July 2018 during the hours of 06:30 and 09:10 using the 2-observer point-count method. We documented a total of 16 species and 182 individuals of grassland birds across the 3 sites, with Leland Wild having significantly greater species richness and abundance than the other 2 sites ( $P < 0.05$ ). Two species documented at all locations utilizing the grasslands for feeding and breeding, *Dolichonyx oryzivorus* (Bobolink) and *Passerculus sandwichensis* (Savannah Sparrow), are listed in the MassAudubon State of the Birds 2017 as being highly vulnerable to the effects of climate change in Massachusetts. Additionally, Bobolinks are listed on the State of North America's Birds 2016 Watch List. With the knowledge that bird species of conservation concern are breeding in the grasslands surveyed, strategies to balance the interests of the breeding birds, farmers, and people engaged in recreational activities can now be considered to improve the breeding success of these bird species.

Sun-PM2-B-2

## The Snake that Loves People

**Tom Tynning** (Berkshire Community College, Pittsfield, MA)

**Abstract** - This is the story of a lonely snake from the Berkshire Hills that set out to change the world—and ended up turning a small part of it upside down. Timber Rattlesnake researchers remain dumbfounded to explain this phenomenon. I could include a bit about the Quabbin issue, too.

Sun-PM2-A-3

## Potential Impacts of Solar Arrays on Wildlife Communities

**Brandi Van Roo** (Framingham State University, Framingham MA)

**Abstract** - With the rate at which solar arrays are being constructed, and often on previously existing open space, it is surprising that there is little to no published research on whether this land conversion impacts wildlife communities. Such a void in our knowledge makes data demonstrating either potential impacts or the lack thereof equally informative. Here I present a preliminary analysis of community surveys of fields subject to different land-use practices: solar arrays, agriculture, or wildlife habitat management. I surveyed mammals, birds, insects, and plants, as well as abiotic factors including soil and air temperatures. The different types of land use created unique combinations of microclimates and disturbance regimes. Surprisingly, above-ground fencing around solar arrays did not appear to hinder wildlife access. Overall, solar arrays were used by common species, but the less common species were found only in fields managed for wildlife. Thus, land-use practices significantly altered species composition rather than species richness. Much more research is warranted on this rapidly expanding land conversion, and in this presentation I suggest several lines of future inquiry.

Sat-PM2-B-5

## **Fruiting Response of Ectomycorrhizal Fungi to Nutrient Additions in Bartlett Experimental Forest, New Hampshire**

**Claudia N. Bashian-Victoroff**(State University of New York College of Environmental Science and Forestry, Syracuse, NY), L. Jamie Lamit (Syracuse University, Syracuse, NY), Ruth D. Yanai (State University of New York College of Environmental Science and Forestry, Syracuse, NY), and Thomas R. Horton (State University of New York College of Environmental Science and Forestry, Syracuse, NY)

**Abstract** - Ectomycorrhizal fungi (EMF) form mutualistic symbioses with a variety of tree species and fill a diverse range of functional niches in forest ecosystems. In addition to improving nutrient and water accessibility for plants, EMF also reduce root herbivory and protect plants from soil pathogens. Therefore, a change in the fungal composition of a forest may impact trees in diverse ways. The community composition of EMF in forest soils may be sensitive to changes in their nutrient environment in ways that have yet to be fully described. Our research investigates the response of ectomycorrhizal communities to nutrient manipulation in a project entitled Multiple Element Limitation in Northern Hardwood Ecosystems (MELNHE) in which nitrogen (N) and phosphorus (P) have been added in a full factorial design since 2011. Mycorrhizal fruit bodies (sporocarps) were collected 5 times from July to October 2018, identified by morphology, and quantified in 3 MELNHE stands of each of 2 successional stages: mid-aged (clear-cut during 1970–1979) and mature (clear-cut during 1880–1890). We analyzed morphological types (morphospecies) using analysis of variance and modeled using multivariate community ordination. Sporocarp abundance and morphospecies richness responded to N and P additions, and these responses differed by forest successional stage. Community composition described by ordination also differed by treatment plots and throughout the fruiting season. We will confirm morphospecies identities using the fungal barcode (ITS region) and repeat community analyses using confirmed molecular identities. While mycorrhizal fungi have been shown previously to respond to nitrogen fertilization, this work is among the first to observe sporocarp response to phosphorus fertilization, and nitrogen and phosphorus fertilization together, which will be important to predicting how fungal communities will respond to varying soil conditions in a changing world.

Sun-PM2-E-2

## **Applied Farmscape Ecology: Managing On-farm Habitats for Beneficials and Nature Conservation**

**Conrad Vispo** (Hawthorne Valley Farmscape Ecology Program, Ghent, NY), Claudia Knab-Vispo (Hawthorne Valley Farmscape Ecology Program, Ghent, NY), and Dylan Cipkowski (Hawthorne Valley Farmscape Ecology Program, Ghent, NY)

**Abstract** - People have long realized the potential role of wild animals in pollinating crops and controlling pests. More recently, the potential role of on-farm habitats in regional nature conservation has also become apparent. This introductory talk will describe how the session will approach the paired questions, What can farms provide to the conservation of wild organisms? / What can wild creatures provide to farm production?, and how it will contribute to the resulting question, how can on-farm habitat management or preservation enhance the synergies between conservation and production? We will briefly illustrate this tack by describing the biodiversity of select on-farm habitats based on our own work with plants and insects in NY's mid-Hudson Valley. At least 4 habitats of regional conservation importance are particularly common on area farms: mature hayfields, wet meadows, dry meadows, and floodplain forests. Aside from the mature hayfields, which are primarily important for grassland birds, the remaining habitats tend to be rich in native plants and can host rare insects. We will profile some of these species, such as wetland butterflies and their host plants; dry meadow wildflowers, grasses, and associated insects; and the rich spring ephemeral flora and ground beetle fauna of stream corridors. We will then explore the role such habitats might play in supporting crop field beneficials by providing resources such as flowers outside of crop bloom, overwintering sites, and supplemental prey. Finally, we will discuss what such considerations imply for the management of on-farm habitats, and, specifically, illustrate the apparent importance of on-farm habitat diversity.

Sat-AM1-E-1

## **Contrasting Life History Strategies of Two Freshwater Mussel Species of *Alasmidonta***

**Susi von Oettingen** (USFWS, Concord, NH), Tina Cormier (Spatial Analyst, Portland, ME), and Barry Wicklow (Saint Anselm College, Manchester, NH)

**Abstract** - Like most freshwater mussels, the larvae (glochidia) of the federally endangered *Alasmidonta heterodon* (Dwarf Wedgemussel) and the state endangered *A. varicosa* (Brook Floater) must attach to a host fish in order to develop and metamorphose to juvenile mussels. In both species, external fertilization occurs in summer and females brood glochidia until the following spring when they release glochidia through the exhalant aperture. Strategies for increasing the probability of glochidial attachment to a host fish are markedly different in the Dwarf Wedgemussel compared with the Brook Floater. We show that the Dwarf Wedgemussel uses the rhythmic undulations of mantle flaps around the exhalant siphon as a lure to attract host fish. As a fish attacks the lure, mantle flaps are quickly withdrawn while glochidia are jettisoned into and around the mouth of the fish. Glochidia attach to the gills and other soft tissues. In contrast, gravid Brook Floater females discharge glochidia in long mucus threads that remain attached to the mussel or to the stream substrate; potential host fish are exposed to glochidia through passive entanglement. Lab experiments show that both mussel species are host generalists, but *Etheostoma olmstedi* (Tessellated Darter) appears to be the primary host fish for the Dwarf Wedgemussel. Passive entanglement is considered a non-selective fish-infection strategy, but bottom-feeding fish are expected to be exposed at higher frequencies. The bottom-feeding fish *Rhinichthys cataractae* (Longnose Dace), *Noturus insignis* (Margined Madtom), and young *Catostomus commersonii* (White Sucker) show the highest glochidial metamorphosis success frequencies for the Brook Floater. Once free from the host fish, metamorphosed glochidia—now juvenile mussels—burrow into the stream bed. Females are reproductive after 3 to 4 years.

Sat-AM1-B-4

## **Stormwise - Integrating Forest and Roadside Management Objectives to Create Storm Resilient Forests**

**Jeffrey S. Ward** (Chief Scientist, The Connecticut Agricultural Experiment Station, New Haven, CT) and Thomas E. Worthley, University of Connecticut, Middlesex County Extension Center, Haddam, CT)

**Abstract** - The band of trees within 100+ feet of roads, i.e., roadside forests, is often left unmanaged because of the potential liability of inadvertently causing a vehicular accident or damaging utility lines during harvest operations. The Connecticut State Vegetation Management Task Force in 2012 recommended that roadside forests in Connecticut be managed to increase utility reliability while also maintaining their aesthetic appeal by integrating silvicultural and arboricultural practices. This recommendation developed into a collaborative project, including The Connecticut Agricultural Experiment Station, The University of Connecticut, Connecticut Department of Energy and Environmental Protection, Eversource, Connecticut Department of Transportation, and several forest landowners, that has focused on practical integration of these management objectives. The goal of is to reduce damage during future severe storms, increase habitat diversity, and recover underutilized volume while also maintaining the aesthetic appeal of roadside forests. Detailed information has been collected on >4300 trees along 5 km of roadside forests at demonstration forests in Coventry, Haddam, Ledyard, Litchfield, Manchester, Mansfield, Monroe, Orange, Prospect, and Voluntown. On portions of each demonstration area, trees immediately adjacent to utility and road corridors were pruned using ANSI A300 standard, and at-risk trees were removed. To the interior, crop-tree management was used to develop trees with wind-firm, open-grown characteristics along with subcanopies of short stature trees, native shrubs, and herbs. The presentation will cover practical lessons learned on tree selection and coordination from implementation and how the risk of tree failure has been reduced. The results can be used to inform communities and stakeholders about the management of roadside forests.

Sat-PM2-A-5

## **Rediscovering Our Species Sense: Developing Natural History Appreciation and Skillsets in Undergraduate Students**

**Justine Weber** (SUNY ESF, Syracuse, NY) and Donald J. Leopold (SUNY ESF, Syracuse, NY)

**Abstract** - Natural history is the foundation of all ecological study, but the skillsets of nature observation and description face diminished significance both in academia and broader society. At the same time, a suite of new app technology has made it possible for individuals to identify organisms using their smartphones, virtually instantaneously. How do these shifts impact ecology in academia, specifically the training of undergraduate biologists? Should undergraduate life science curricula emphasize the careful observation and description of organisms, or move on to more esoteric, synthetic topics? For the past 6 years I have organized, developed, and taught in a unique biodiversity survey course at SUNY ESF. I will explain how the course seeks to develop and grow natural history skillsets in our undergraduate biology students, and suggest paths forward in strengthening natural history's place in undergraduate education.

Sun-AM1-C-4

## **n of 1: Spatial Ecology of an Eastern Coyote Along the East Bronx Waterfront**

**Mark Weckel** (American Museum of Natural History; New York, NY), Peter Galante (Center for Biodiversity and Conservation, American Museum of Natural History; New York, NY), Chris Nagy (Mianus River Gorge; Bedford, NY), Ally Steinman (Science Research Mentoring Program, American Museum of Natural History; New York, NY), Yisi Zhu (Science Research Mentoring Program, American Museum of Natural History; New York, NY), Ana Vera (Science Research Mentoring Program, American Museum of Natural History; New York, NY), and Tyler Nishimoto (Science Research Mentoring Program, American Museum of Natural History; New York, NY)

**Abstract** - New York City is at the edge of *Canis latrans* (Coyote) range expansion in New York State. In our presentation, we share preliminary results from telemetry monitoring of an adult male Coyote (44447) living along the densely developed east Bronx waterfront in NYC. First identified by non-invasively collected DNA in 2015, Coyote 44447 was tracked for a full calendar year (Feb 2018–Feb 2019) using GSM-GPS technology. Location data was collected using an on-collar GPS unit and transmitted to a server via the GSM (cell) network. The latter allowed for 2-way communication between researchers and the collar. After an initial 2 months of monitoring, we reprogrammed the collar to take GPS points every 4 hours when the Coyote was on its core range (corresponding to Ferry Point Park) and then every 30 mins outside of this park, allowing us to capture more detailed movement through the urban matrix. Coyote 44447 occupied a predictable home range consisting of 3 urban parks separated by tidal creeks, housing, and industrial development. His movements also support studies of other urban Coyotes showing selection for natural areas and avoidance of the urban matrix.

Sun-AM1-D-4

## **New Conservation Tools and Guidelines for Restoring Sandplain Grasslands in New England**

**Robert Wernerehl** (State Botanist of Massachusetts, Natural Heritage and Endangered Species Program, Division of Fisheries and Wildlife, Westborough, MA)

**Abstract** - Sandplain grasslands are a globally rare plant community that is found from the Hempstead Plains on Long Island, NY, to Kennebunk Plains in Maine. It includes *Schwalbea americana* (American Chaffseed), a federally endangered, fire-adapted plant species. I have been working for 3 years with a multi-partner working group on the issue of conservation and management of this ecosystem in New England. The Sandplain Grassland Network is a consortium that includes the Massachusetts Natural Heritage and Endangered Species Program, The Nature Conservancy, The Trustees of Reservations, Woods Hole Research Center, and a number of other well-established non-profit conservation groups. We have assembled a research library, documented a number of case studies, and developed management guidelines for many different situations, and we continue to conduct research on management techniques and rare species conservation. My talk will be split into 4 short sections: The people and organizations behind the effort, the content of the website, a brief tour of some interesting and important sites, and changes managers have made as a result of participation in the network. Our website URL is <http://sandplaingrassland.net/>.

Sun-PM2-C-3

## **Sandplain Gerardia: Federally Listed Plant Monitoring in Massachusetts**

**Robert Wernerehl** (State Botanist of Massachusetts, Natural Heritage and Endangered Species Program, Division of Fisheries and Wildlife, Westborough, MA)

**Abstract** - *Agalinis acuta* (Sandplain Gerardia), is an attractive, pink-flowering, federally threatened annual species in the *Orobanchaceae* (broom-rape family) that occurs in sunny coastal grasslands on sandy outwash plains. Monitoring of this species goes back 38 years in Massachusetts, beginning with remnants in cemeteries on Cape Cod and Martha's Vineyard. Populations were then introduced to a few locations where the habitat could be maintained with prescribed fire or other disturbance. Over the years, populations have varied between 180,000 plants to a few hundred plants within the same location, presenting challenges for counting and expectations for staff in order to plan the counts. As well as sharing photos of these interesting and unique sites and associated rare plant species, I will explain our current Natural Heritage and Endangered Species Program's methodology for monitoring for this species, and why annual monitoring may be necessary.

Sun-AM2-D-2



## Tracking Rare Sedges in Massachusetts

**Robert Wernerehl** (State Botanist of Massachusetts, Natural Heritage and Endangered Species Program, Division of Fisheries and Wildlife, Westborough, MA)

**Abstract** -As state botanist, I track some 82 sedge species in Massachusetts, conducting field surveys and documenting their populations. I'll tell some stories of my efforts seeking out members of the *Cyperaceae* (the sedge family), such as forcing my way through thickets of invasive shrubs, kayaking in a pristine Berkshire lake, daintily tripping over thin sedge mats hoping not to fall through, and hunting on my hands and knees in the mud for 2-inch high *Rhynchospora* species (beak rushes) on coastal plain pond shores. I'll also briefly describe surveys and monitoring for federally threatened *Scirpus ancistrochaetus* (Northeastern Bulrush) in Massachusetts and the habitat where the populations occur.

Sat-PM2-C-3

## Common Orchid Conservation Efforts in New England

**Laney Widener** (New England Wild Flower Society, Framingham, MA and Concord Land Conservation Trust, Concord, MA) and Julianne McGuinness (North American Orchid Conservation Center, Edgewater, MD)

**Abstract** - Orchids are intimately tied to their habitats, relying on fungi and pollinators to complete their life cycles. The New England Wild Flower Society and the North American Orchid Conservation Center (NAOCC) are collaborating to conserve the native orchids of our region, focusing on common species first. Through collection of seeds and leaf and root tissues, we are building a program to better understand the types of fungi associated with our native orchids and develop protocols to propagate and restore all native orchid species. Seeds are added to our seedbank for conservation purposes, leaves are collected for DNA analysis, and root samples are used to isolate and propagate associated mycorrhizal fungi. All collections have been completed by trained volunteers throughout the New England region.

Sun-PM2-D-5

## The New England Plant Conservation Volunteer Program

**Laney Widener** (New England Wild Flower Society, Framingham, MA and Concord Land Conservation Trust, Concord, MA; [info@concordland.org](mailto:info@concordland.org))

**Abstract** - The New England Wild Flower Society has been working with state Natural Heritage programs, regional land managers and volunteers for over 25 years to monitor and search for rare plants. Hundreds of volunteers participate each year in the Plant Conservation Volunteer Program—the oldest rare plant monitoring program in the United States. On average, volunteers monitor 450 occurrences of rare plant species annually throughout New England. Volunteers also participate in seed collection of rare species, contributing to our seed bank for long-term storage and conservation purposes. This citizen science effort has provided valuable data to help guide rare plant conservation and protection in the New England region.

Sat-PM2-D-4

## **Mercury Contamination in Protected Areas: Comparing Riparian Songbird Concentrations Across Five US National Parks**

**Veronica A. Winter** (Purchase College, SUNY, Harrison, NY), Allyson Jackson, (Purchase College, SUNY), Collin Eagles-Smith (USGS Forest and Rangeland Ecosystem Science Center, Corvallis OR), David Evers (Biodiversity Research Institute, Portland ME), Evan Adams (Biodiversity Research Institute, Portland ME), Colleen Flanagan-Pritz (National Park Service, Air Resources Division, Denver CO), Kristi Morris (National Park Service, Air Resources Division, Denver CO), Sarah Nelson (School of Forest Resources, University of Maine Orono, ME), Rebecka Brasso (Weber State University, Ogden, UT)

**Abstract** - Mercury (Hg) is a globally distributed pollutant that poses a great risk to humans and wildlife health, affecting reproduction and overall fitness. Because Hg moves through the atmosphere across state and national boundaries, even protected habitats like the US National Parks are not immune from Hg pollution. Under appropriate conditions in wetland areas, inorganic Hg is microbially converted to methylmercury (MeHg). This highly toxic organic form allows for bioaccumulation and magnification through the food web, including aquatic and terrestrial wildlife. We focused this study on riparian songbirds in 5 National Parks across the continental United States: Acadia ( $n = 59$ ), Grand Teton ( $n = 65$ ), Mount Rainer ( $n = 24$ ), Olympic ( $n = 151$ ), and Yosemite ( $n = 68$ ). Whole blood total Hg (THg) concentrations varied from 0.006 to 1.441  $\mu\text{g/g}$  wet weight. Coastal parks that were also generally wet regions, such as Olympic (within 80 km of the ocean), Acadia (within 2 km), and Mount Rainer (within 190 km), experience higher THg levels in their songbird populations than areas that are more inland ( $>300$  km from an ocean) and arid, such as Yosemite and Grand Teton. Across all parks, species that rely more heavily on insect prey during the breeding season generally presented higher THg concentrations. This study can be used as a baseline to understand Hg exposure from non-point source pollution across the United States.

Sun-PM2-B-4

## **Assessing Roadside Oak Mortality in Eastern Connecticut Due to Gypsy Moth Defoliation and Other Factors**

**Thomas E. Worthley** (University of Connecticut, Middlesex County Extension Center, Haddam, CT)

**Abstract** - The severe mortality of *Quercus* spp. (oak trees) during the winter of 2017 to 2018 resulting from a combination of recent *Lymantria dispar* (Gypsy Moth) infestations (defoliations) and drought conditions experienced in 2016 and 2017 included large numbers of roadside trees. The sheer degree and extent of oak tree mortality in central and southeastern Connecticut was unexpected and unprecedented and has overwhelmed the capacity of the State Department of Transportation, local tree wardens, and utilities to address the problem. Very large dead trees with wide spreading crowns are quite numerous along many roadways in eastern Connecticut. These conditions are quite variable. One can drive several miles along a local road and not see any dead trees and then pass a stretch that has as many as 30 or 40 dead trees per mile. Implications for public safety are apparent. Initial data from a random sampling of 160 miles of local roads in numerous Eastern Connecticut towns from Sprague to Durham has indicated an average of 14 dead roadside trees per mile, half of which can be categorized as high potential risk to people and infrastructure. This presentation presents a summary of the roadside mortality survey, illustrates the associated public safety issues and suggests some management ideas for communities and landowners facing this issue.

Sat-PM2-A-3

## **Habitat Selection and Dispersal of the Northern Barrens Tiger Beetle (*Cicindela patruela*) in the Hudson Valley, New York**

**McKenzie Wybron** (SUNY ESF, Syracuse, NY), Melissa Fierke (SUNY ESF, Syracuse, NY), Dylan Parry (SUNY ESF, Syracuse, NY), and Matthew Schlesinger (NY Natural Heritage Program, Albany, NY)

**Abstract** - In 2004, *Cicindela patruela patruela* (Northern Barrens Tiger Beetle) was rediscovered in the dwarf *Pinus rigida* (Pitch Pine) barrens at Sam's Point Preserve on the Shawangunk Ridge, NY. This tiger beetle occurs only at this single location and is extirpated from the 6 locations across New York where it was historically present. This tiger beetle can be found mostly in open sandy or rocky areas and sometimes in the surrounding low vegetation. We performed a mark-recapture study for 2 summers resulting in 199 beetles marked in 2017 and 72 marked in 2018. Habitat surveys were conducted within Sam's Point Preserve, surrounding Sam's Point Preserve, and where the Northern barrens tiger beetle had been found historically. We used RandomForest package in R to identify increased percent cover of pebbles and decreased percent cover of duff as important variables to the Northern Barrens Tiger Beetle habitat preferences.

Sat-PM2-E-2

## **The Monitoring of Seabeach Amaranth (*Amaranthus pumilus*) on Long Island**

**Steve Young** (NY Natural Heritage Program, Albany, NY)

**Abstract** - Seabeach Amaranth is a federally threatened and state-threatened (S2) low-growing plant that occurs on the Atlantic Ocean beaches of Long Island. Its range extends from South Carolina to Long Island with historical records in Rhode Island and Massachusetts. There are recently introduced populations on Cape Cod. It was first recorded in New York in 1843, with sporadic collections to 1950, but it was not seen on Long Island again until the summer of 1990 when 9 populations were documented spread out along most of the south shore of Long Island. The New York Natural Heritage Program, the US Fish and Wildlife Service and many other partners have continued to survey the plants through 2018. Our survey goals are to measure and record: the number and location of plants with their associated species from year to year, the size distribution of plants at individual sites, the phenology and growth rates of selected plants, how beach nourishment and stabilization of beaches affect plants, and how different types of habitat disturbance affect plants. Plant counts show that most years the number of plants varies from the hundreds to 10,000 plants, but for 4 years in the early 2000s there was a large jump in numbers into the hundreds of thousands. The exact causes of these fluctuations are complex and not fully understood.

Sun-AM2-D-1

## **Impacts of Global Change on Reproductive Phenology and Success of Tree Swallows**

**Lucy Zipf** (Boston University, Boston MA), **Richard Primack** (Boston University, Boston MA) **Elissa Landre** (Broadmoor Wildlife Sanctuary Mass Audubon, South Natick, MA)

**Abstract** -Migratory aerial insectivores, a group of birds named for their foraging strategy, have experienced significant population declines in North America over the last 30 years. These declines, which began in the early 1980s, are particularly pronounced in the Northeast US and Canada. Aerial insectivore decline is likely caused by a combination of factors, rather than a single driver. The potential driver we are investigating is decline in reproductive success as a consequence of global change. Average annual precipitation in northeastern North America, the area in which aerial insectivores are declining most dramatically, has increased 10% since 1895 and is predicted to continue rising. This predicted increase will primarily take place during the spring and winter. Precipitation can prevent flight of insects, which limits foraging opportunities for aerial foragers. Though increased precipitation during the breeding season associated with climate change may be contributing to the hypothesized decline in reproductive success of aerial insectivores, their effects on aerial insectivore reproductive success remains understudied. Using *Tachycineta bicolor* (Tree Swallow) reproductive timing and success data collected over a 32-year period (1987–2018) we have investigated the relationship between reproductive timing and success with climate and over time. Here, we show that Tree Swallow reproductive success is declining in Massachusetts and these declines are associated with increasing precipitation and storm events. Further, increased spring precipitation can delay reproductive phenology in the species, which may lead to further reductions in reproductive success. Our work also highlights management strategies that may offset some of the negative effects of our changing climate on breeding populations of Tree Swallows.

Sat-AM2-C-4