ORAL PRESENTATION ABSTRACTS

November 16, 2019 | Keene State College

Abstracts are listed in alphabetical order by the lead author's last name. Presenters are denoted with an asterisk (*).

On the Trail of Bobcats: Tracking and Camera Traps to Study *Lynx rufus*

Eric Aldrich (The Nature Conservancy) and Dallas Huggins**

Abstract: Field surveys are an invaluable part of wildlife research, from supplying data and research samples to promoting conservation, informing and engaging the community, and better understanding population dynamics and wildlife behavior. Two New Hampshire naturalists have led four years of field research on local bobcat (*Lynx rufus*) populations in Hancock, NH, in collaboration with the Harris Center for Conservation Education. Expanding on studies by UNH and the New Hampshire Fish and Game Department on bobcat population dynamics, their research focuses on a part of southwestern New Hampshire that has a long legacy of land protection and excellent bobcat habitat. Field investigations coupled with GPS tracking and camera trapping assist in identifying core areas, travel corridors, denning sites, and behavioral aspects of familial and individual bobcats. Continued monitoring can improve understanding of bobcat behavior and habitat use, which can in turn advance land protection goals and improve public understanding of this top predator's role in the ecosystem. As an exemplary charismatic megafauna and seldom-seen top predator, bobcats hold a coveted place for capturing the public's interest in wildlife and habitat. The more we learn and share the bobcat's story, the more we can gain the public's enthusiasm and understanding of wildlife and safeguarding habitat for long-term resiliency.

Presenter Bios*: **Eric Aldrich** is a long-time marketing manager for The Nature Conservancy (North America Conservation Strategies) and formerly worked as a reporter/columnist for the* Keene Sentinel *and spokesman for the New Hampshire Fish and Game Department. **Dallas Huggins** is a software developer for Rocket Insights and a graduate of White Pine Programs wildlife tracking course. Eric and Dallas of Nottingham have been camera trapping and tracking bobcats in and around Hancock for four years in an independent research project.*

Session: Wildlife

Restoring Young Forest Species in Southwest New Hampshire – How You Can Play a Part in Supporting an Important Forest Ecosystem

Tom Brightman (New Hampshire Fish and Game)*

Abstract: This talk will include a brief history of young forests in southwest New Hampshire, and focus on the types of species that benefit from young forest and shrubland habitats — along with the stewardship actions needed, and the tools available, for landowners to provide this type of habitat on their property. Young forest and shrubland plant community structure will also be discussed, along with a variety of game and non-game mammals, birds, reptiles, and amphibians.

Presenter Bio*: **Tom Brightman** is a Wildlife Habitat Biologist with New Hampshire Fish and Game's Nongame and Endangered Wildlife Program. He works directly with private, public, and institutional landowners to develop and implement wildlife habitat management plans, primarily for a variety of young forest and shrubland wildlife species. Previously, Tom was the Land Stewardship Manager for Longwood Gardens and a Conservation Easement Stewardship Manager with the Brandywine Conservancy. He also taught graduate-level conservation and land management courses at the University of Pennsylvania. He has a keen interest in the ongoing relationship of people to the land. Tom holds a B.A. in American Civilization, and a Masters of Environmental Studies, both from the University of Pennsylvania.*

Session: Forest Habitat Management

Ten-Year Trends in Migratory Raptor Numbers at the Pack Monadnock Raptor Observatory, Peterborough, NH

Phil Brown (Harris Center for Conservation Education / New Hampshire Audubon)*

Abstract: Since its founding in 2005, the Pack Monadnock Raptor Observatory in Peterborough, NH has revealed some interesting trends about migratory populations of diurnal birds of prey (raptors). This research and education project staffed by the Harris Center for Conservation Education and founding partner New Hampshire Audubon is now in its 15th year and has yielded a regionally-significant dataset. Through the Raptor Population Index (RPI), a partnership between four leading hawk watch and migration research organizations – the Hawk Migration Association of North America (HMANA), Hawk Mountain Sanctuary (HMS), HawkWatch International (HWI), and Bird Studies Canada (BSC) – raptor migration data from select hawk watch locations in the western hemisphere are periodically analyzed in order to produce population estimates of raptor species.

The most recent analysis, completed in 2016, utilized hawk watch data collected over a ten-year period between 2006 and 2015. For the first time, Pack Monadnock's dataset was chosen for inclusion due its long duration (10+ years) and consistent methodologies for monitoring migratory raptors. It is the only New Hampshire hawk watch site that has met these criteria and one of only 63 in the western hemisphere. Pack Monadnock's data fills a critical geographic gap in northern New England, which is underrepresented by long-term hawk watch sites, thus providing information about raptor migration across the region and identifying needs for further research.

The 2016 RPI analysis revealed notable trends for many of the fifteen species of migratory raptors that regularly pass through our region. Among these are expected trends consistent with those observed across the Eastern Flyway, such as a continued increase in Bald Eagle and Turkey Vulture numbers, as well as a decrease in American Kestrel, Sharp-shinned Hawk, and Cooper's Hawk. However, other trends were less expected or resulted in a newer understanding of regional migratory raptor populations, such as a slight increase in Northern Harrier and Merlin, a strong increase in Peregrine Falcon, and a decrease in Red-tailed Hawk and Osprey. Reasons for some of these changes are less understood and perhaps quite varied, but the analysis highlights a need for further research on many of these species and a greater need for further raptor migration monitoring in northern New England.

Presenter Bio*: **Phil Brown** has coordinated the Pack Monadnock Raptor Observatory in Peterborough, NH for 10 years – first with New Hampshire Audubon and now as the Hawk Watch Coordinator for the Harris Center for Conservation Education, who is partnering with NH Audubon to run the Observatory. Phil is also the Director of Land Management for NH Audubon, where he directs statewide land protection and stewardship activities for the organization. Phil studied Natural Resource Management at Rutgers University as an undergraduate and Conservation Biology at Antioch University New England for master's work.*

Session: Wildlife

Rivers Without Humans: What Our Rivers Look Like Without Direct Modern Human Impacts

Denise Burchsted (Keene State College)*

Abstract: What should a river look like? This fundamental question lies at the heart of our river management practices. However, it is remarkably challenging to answer this question clearly. To address this fundamental question indirectly, I will show data that addresses the “baseline condition” of rivers in the Monadnock Region, which would be our best approximation of our rivers prior to modern human impacts.

In this talk, I will present data from a physical survey of rivers on protected lands in Hancock and Surry, NH. I will interpret these data in the context of recent maps, showing land use change, and written historical records. My findings are that, most broadly, our valley bottoms were far wetter prior to European colonization, with innumerable ponds and side river channels. The presence of natural dams, which are leaky dams that slow water flow – such as beaver dams and log jams – create these ponds by retaining water, and they also create side river channels by forcing water out of the main riverbed. These networks of leaky dams, ponds, and side channels are largely absent from our modern landscape. This absence has serious implications for our aquatic ecosystems, which developed in the presence of these features. Only an extensive management program of “cleaning” rivers, which continues to this day, can maintain the river networks we are currently accustomed to. This talk concludes with broad questions regarding implications of these findings for river management.

Presenter Bio*: **Denise Burchsted**’s expertise is in fluvial geomorphology (Ph.D., University of Connecticut), aquatic ecology (M.F.S., Yale), and water resources engineering (B.S., University of Connecticut, and a licensed Professional Engineer). She is an Associate Professor at Keene State College, where she teaches Environmental Studies. As a scientist, she studies rivers with limited modern human modification to generate scientifically-based targets for river restoration. In addition to scientific research she has worked as a consulting engineer and environmental advocate. In these roles, she has designed dam removals and other fish passage projects, designed salt marsh and freshwater wetland restoration projects, evaluated restoration alternatives in the Everglades, and led non-profit watershed conservation planning efforts*.

Session: Water

Abbott Thayer's Monadnock: The Intersection of Natural History, Artistic Research, and World War

*April Claggett**

Abstract: The life and work of Abbott Thayer (1849-1921) — Dublin, NH resident, natural historian, and a leading American artist in his day — present an interdisciplinary case study of the role of nature as a "medium" in the fullest sense of the word. Convinced that his perceptual skills as an artist led him to solve problems that scientists could not, Thayer immersed himself in intense observation of Dublin's woods and made revelations with far-reaching implications that landed on the desks of Churchill, Roosevelt, and Darwin's colleague, Wallace. Both his scientific illustrations and his aestheticized landscapes of Monadnock — rarely taken together in analysis — are better reconciled when nature is understood as mediated by cognitive processes and broad cultural ideas, rather than as "natural."

Presenter Bio*: **April Claggett** is an independent artist and art historian living in Dublin, NH. This talk combines several personal and professional pursuits: the love of the local outdoors, the practice of art, and the meaning of visual representations.*

Session: Humans & Nature

What do you see? Citizen Science Opportunities in Wildlife Distribution Mapping and Studies

Melissa Doperalski (New Hampshire Fish and Game)*

Abstract: Citizens have and can continue to make huge contributions to what we know about the species in our state. Much of what we have learned has come from citizens, consultants, and partners sharing information they have on wildlife sightings, vernal pool surveys, and research and study findings. In this talk, we will discuss the evolution of the New Hampshire Reptile and Amphibian Reporting Program and how you can contribute, as well as other citizen science opportunities that you can get involved in with New Hampshire Fish and Game.

Presenter Bio*: **Melissa Doperalski** is a Certified Wildlife Biologist with New Hampshire Fish and Game (NHFG)'s Nongame and Endangered Wildlife Program. Melissa works with all the reptiles, amphibians, freshwater mussels, and beetles in the state. She also runs the Environmental Review Program and manages the Wildlife Sightings website, as well as the wildlife Natural Heritage Bureau records. Prior to working for NHFG, Melissa worked for the Minnesota Department of Natural Resources as an Environmental Assessment Ecologist and Director of the Environmental Review Program. Melissa is a Certified Biologist with the Wildlife Society and has an M.S. from the University of Wisconsin - Steven's Point.*

Session: Ecological Inventory

Biome as Barometer: Mountain as Microcosmos

Emily Drury (MacDowell Colony)*

Abstract: This research is concerned with plants, and reassembling plant communities, as registering, indexing, and making visible incremental climate change that is otherwise "unseeable" and therefore "unknowable." It focuses on Mount Monadnock as a site with a richly entangled ecological and cultural history, and as a unique site for observation, description, and the production of narrative during this critical contemporary moment. In this talk, I will present drawings that illustrate these ideas at a variety of scales, using representational tools from the discipline of landscape architecture and accompanying text.

Session: Mount Monadnock

Humans and Nature in the Monadnock Region: The First 12,000 Years

Robert Goodby (Franklin Pierce University) and Tonya Largy (Harvard University)*

Abstract: Native Americans have lived in the Monadnock Region for over 12,000 years. This talk uses archaeological data to reveal their use of the landscape and natural resources, describing settlement patterns, seasonal movements, technology, site settings, and responses to climate change. Archaeological evidence from sites in Swanzey, Peterborough, Hinsdale, and Keene reflect their use of a broad range of terrestrial and aquatic animals, ranging from caribou at the end of the Pleistocene to anadromous fish and timber rattlesnakes during the Late Archaic and Woodland periods, c. 5,000-700 years before present. Site settings show that major rivers, tributary streams, and wetlands were all integral to Native American economies. Archaeological data also contribute to an understanding of long-term patterns and changes in species ranges that has potential utility for modern conservation and wildlife management.

Presenter Bio*: **Robert Goodby** is Professor of Anthropology and Director of the Honors Program at Franklin Pierce University. He has a Ph.D. in anthropology from Brown University and over thirty years of experience excavating Native American archaeological sites in New England. He is a past president of the New Hampshire Archaeological Society, a former Trustee of the Mount Kearsarge Indian Museum, and has served on the New Hampshire Commission on Native American Affairs. He has directed over 300 archaeological studies authorized by the National Historic Preservation Act, including the excavation of the 12,600-year-old Tenant Swamp Paleoindian site in Keene.*

Session: Humans & Nature

Retracing the Land Use History of Franklin Pierce University's Rindge Campus through Student-Generated Trail Signs

John Harris (Franklin Pierce University)*

Abstract: For two decades, students in the Environmental Science program at Franklin Pierce University (FPU) have been documenting the land use history of their 1,000-acre campus in Rindge, NH. Relying on Tom Wessels' remarkable field guide *Reading the Forested Landscape*, the students have examined landscape clues in order to create trail signs highlighting key features of the five working farms recorded in the 1850 Rindge agricultural census. Utilizing selected student signs, this presentation will trace the evolution of the site's land use history from industry and agriculture to summer estate and academic enterprise. Highlights include one of the town's earliest home sites, the propagation of Merino sheep, the production of local woodenware, the abandonment of crop land and purchase by an eccentric gentleman farmer, evidence of the Hurricane of 1938 as well as a freak tornado in 1928, the installation of a Boy Scout camp and summer resort, and the discovery of a child's shoe in the oldest building on campus. The presentation will rely on slides designed and written by FPU students.

Presenter Bio*: **John Harris** served as the Executive Director of the Monadnock Institute of Nature, Place and Culture at Franklin Pierce University from 1996 to 2016. He has taught in the Environmental Science Department at FPU since 2016. His publications include* Returning North With Spring: Retracing the 17,000 Mile Odyssey of Naturalist Edwin Way Teale (2016), Beyond the Notches: Stories of Place in New Hampshire's North Country (2012), and Where the Mountain Stands Alone: Stories of Place in the Monadnock Region (2006). *He holds a Ph.D. from the University of North Carolina, Chapel Hill.*

Session: Humans & Nature

The Geology of Monadnock

Charles Kerwin (Keene State College)*

Abstract: The summit of Grand Monadnock is 3,165 feet above sea level and is considered to be the most climbed mountain in the world. It has had a long history that began pre-Pangea as volcanic island arcs were shedding sediments into an ocean basin that was closed during the collision of continents that created a supercontinent. Those sediments were buried, cooked, and deformed and later exposed by weathering and erosion processes that culminated with a prolonged ice age. The results are what can be seen today and it is an interesting tale.

Presenter Bio*: **Charles Kerwin**, Ph.D., works as a geology instructor at Keene State College. He has mapped several hundred square miles of New Hampshire bedrock under the EDMAP and STATEMAP programs, and has mentored students on senior mapping projects of their own.*

Session: Mount Monadnock

To Fence or Not to Fence: Controlling Deer Browse in Regional Forests

Hana Kiewicz-Schlansker[*1]; *Rick Brackett*[2]; *Merrilee Frable*[1]; *Ashley Dawson*[1]; *and Peter Palmiotto*[1]
[1]*Antioch University New England* [2]*Monadnock Conservancy*

Abstract: White-tailed deer (*Odocoileus virginianus*) have been called keystone species and ecosystem engineers, as overabundant populations have the potential to shift species composition in forest ecosystems. With a lack of natural predation and decreased active hunting by humans, population density of white-tailed deer has increased dramatically in places across the Northeast, including the Monadnock Region. Therefore, maintaining the forest composition of desired species presents challenges to forest managers. Is fencing the answer? Do deer really have an impact on plant species composition in Monadnock Region forests? Research at the Maynard Forest, a 91.4-acre property in Gilsum, NH that is owned and managed by the Monadnock Conservancy, provides some answers.

The research on the Maynard Forest was established in 2014 to examine and compare the effect of deer exclosures and beech control treatments on forest regeneration and herbaceous plants. Research plots were established in six patch cuts 1 to 1.5 acres in size. Three of the six patch cuts were randomly selected along with an adjacent forested area of similar size and enclosed by 8-foot high fencing to exclude deer. Within these areas, three treatments were applied: control (no change), a one-time foliar application of chemical herbicides, and a one-time mechanical cutting using loppers and brush saws. Regeneration was sampled three and five years after treatments.

Our results indicate that fencing is an incredibly effective tool that allows rapid growth of regenerating woody species where impacts from deer browse would otherwise inhibit growth. Both mechanical and chemical treatments were effective at reducing average height and abundance of American beech, thereby allowing regeneration of pioneer species. The herbicide treatment seemed to have a suppression effect on height, density, and species richness. Little to no negative impacts of deer browsing were found on herbaceous species. Study design and implementation was a collaboration between the Monadnock Conservancy, Antioch University New England, and UNH Cooperative Extension, and was funded by a NRCS Conservation Innovation grant.

Session: Forest Habitat Management

Impact of Phosphorus Inputs on Wetlands and Water Quality in the Pearly Pond Watershed, Rindge, NH

Catherine Koning[*1] *and Shannon Stroble*[1]
[1]*Franklin Pierce University*

Abstract: Water quality in Pearly Pond (Rindge, NH) has been monitored since 1992, confirming that the lake suffers from excessive phosphorus, causing it to become eutrophic. In some years, this has led to a bloom of blue-green algae, which can be unhealthy and can lead to a decrease in dissolved oxygen. The primary driver of the shift to eutrophic status appears to have been the release of phosphorus from the Franklin Pierce University (FPU) wastewater treatment facility (WWTF) into a complex of wetlands north of the lake from 1967-2008. However, the in-pond concentrations of phosphorus continue to be high even after the treated wastewater was diverted into a system of rapid infiltration beds. Watershed model results and subsequent water quality monitoring in lake tributaries show that the wetlands north of the lake are still contributing phosphorus, but it is unclear whether this represents residual phosphorus loads from the soils in the wetland, or whether it is ongoing inputs from rapid infiltration bed outflow. One other tributary shows some concerning results which were not predicted by the model. Phosphorus inputs to the wetlands have had impacts on plant biodiversity, including the spread of the invasive species *Phragmites australis*.

Presenter Bio*: **Catherine Owen Koning** is a Professor of Environmental Science at Franklin Pierce University in Rindge, NH. She received her B.A. in Biology and Environmental Studies from Bowdoin College, her M.S. in Ecology from the University of California-Davis, and her Ph.D. in Land Resources from the University of Wisconsin. Dr. Koning's interests are in wetland ecology, watershed management, conservation biology, and sustainability. She has conducted research in wetland ecology, hydrology, water quality, and plant ecology in Maine, New Hampshire, California, and Wisconsin. She has served on the Board of the Wisconsin Wetlands Association, the New Hampshire Association of Wetland Scientists, and the New England Chapter of the Society of Wetland Scientists. She recently published her first book,* Wading Right In: Discovering the Nature of Wetlands*. Dr. Koning has also been active in campus sustainability efforts, and is a founding partner of the Franklin Pierce Climate Action Institute.*

Session: Water

Glover's Ledge Bio-Inventory: How a Biodiversity Survey on a Small Property Transformed into a Regional Call for Action

Steven Lamonde[*1]; Erin Glocke*[*1]; and Michael Akresh*[1]
[1] *Antioch University New England*

Abstract: The Monadnock Region's forest-dominant habitat matrix and mixed land-use history are exhibited at Antioch University New England's 80-acre Glover's Ledge property (Langdon, NH), making this property a suitable representation of regional species diversity and an ideal spot for studying the area's natural and introduced species diversity. Detection of spatial and temporal ecological changes relies critically upon species occurrence datasets. To establish a biodiversity dataset of species occurrence for Glover's Ledge, we conducted a formal, mixed-methods biological inventory. Occurrence data were primarily collected during three intensive BioBlitz events. Additionally, species lists from student-generated reports and casual iNaturalist and eBird observations by visitors complemented our BioBlitz efforts. To identify regionally-unique occurrences from our compiled species list for Glover's Ledge, we compared our records with data from iNaturalist and the Global Biodiversity Information Facility. Over the past five years, Antioch students conducted nine studies and three BioBlitzes, documenting over 2,000 observations and 650 species. Of these species, at least 31 are first records for the Monadnock Region and one is a first record for New Hampshire, to the best of our knowledge. Combined, these efforts display a detailed picture of the property's biodiversity and provide critical baseline data for future forest management and monitoring. Regionally, our data comparison exposed significant gaps in the documented biodiversity of the overall Monadnock Region. Given that habitats at Glover's Ledge are representative of habitats elsewhere in the region, we believe that many new species documented at Glover's Ledge also likely occur elsewhere within the region. Our study underlines an ongoing need to collect and share biodiversity data across the Monadnock Region, which will help researchers better monitor range shifts in climate migrants, the spread of invasive species, and changes in populations over time.

Presenter Bios: ***Steven Lamonde*** *is a Post-Graduate Fellow in the Department of Environmental Studies at Antioch University New England. While much of his current research investigates multi-scale patterns of habitat selection in* Vermivora *warblers within Vermont's Champlain Valley, Steven works on a variety of spatial projects from mapping historic cellar holes to identifying regional wildlife corridors. In his spare time, Steven co-coordinates the Antioch Bird Club and guides birding trips throughout New England. If you see Steven at the conference, ask him a bird question!* ***Erin Glocke*** *is a second-year master's student at Antioch University New England, pursuing a degree in Environmental Studies with a concentration in Environmental Education. She holds a bachelor's degree from Pennsylvania State University in Childhood and Early Adolescent Education. Erin has worked with young people in several capacities, from camp counseling to classroom teaching, and is focusing her career goals on helping others to build critical skills, a sense of identity, and the confidence needed to positively participate in their communities. She is currently the education and outreach coordinator for Glover's Ledge and is pursuing projects to improve engagement on the property.*

Session: Ecological Inventory

Ecological Stewardship for Wildlife Diversity

Jeff Littleton (Moosewood Ecological LLC)*

Abstract: Ecological stewardship is the careful and responsible management of the land and its natural resources. This type of land management for wildlife diversity has been a key concern for many private landowners, land trusts, and businesses, as well as federal, state, and municipal government bodies.

Amy Bodwell and Carol Saunders have been actively managing their Woodland Views property in Roxbury, NH since 2009. The 235-acre property includes forests, pollinator meadows, shrublands, and shoreland on a rural pond. In 2013, Amy and Carol hired Jeff Littleton, principal ecologist of Moosewood Ecological LLC, to study their property. The goal was to develop a stewardship plan to promote wildlife diversity and ecological integrity, with a special focus on species of conservation concern. This effort included assistance from many Antioch University New England interns and students, Keene High School students, and various natural resource professionals in forestry, wildlife ecology, and entomology.

This talk will touch upon the various stewardship activities at the Woodland Views property, which have been informed by a long-term ecological monitoring program of wildlife and plants since 2013. Results of the initial ecological inventory and continued monitoring have revealed over 30 species of conservation concern, including a variety of birds, mammals, and pollinators. This talk would appeal to a multifaceted group of landowners that are interested in managing for wildlife diversity and ecological integrity in a changing climate. I will also include some potential funding mechanisms that we have employed at Woodland Views over the past ten years, as well as introduce key personnel at various state agencies that can assist landowners with ecological stewardship planning and management.

Presenter Bio: ***Jeff Littleton*** *has 30 years of experience in ecological research, inventory, and education. He graduated from Georgia Southern University in 1995 with a B.S. in Biology, focusing on wildlife ecology. Later, he attended Antioch University New England, where he graduated with an M.S. in Conservation Biology. In 2002, he formed Moosewood Ecological LLC to offer consulting services for conservation planning, stewardship planning and land management, and habitat restoration. Since 2007, he has served as adjunct faculty at Antioch University New England, where he teaches forest community ecology, interpreting past land use histories, and inventory techniques for wildlife and their habitats. In a volunteer capacity, Jeff serves as the treasurer of the Monadnock Sustainability Network, an organization of business and community leaders who support sustainable living practices through education, outreach, and collective action.*

Session: Ecological Inventory

Working Lands for Wildlife – Northeast Turtles – Using State Conservation Plans to Guide Land Use Practices

Josh Megyesy (New Hampshire Fish and Game)*

Abstract: Working Lands for Wildlife (WLFW) Northeast Turtles, led by the USDA's Natural Resources Conservation Service (NRCS), is a model of partnership between the USFWS, states, and conservation groups that incentivizes voluntary landowner participation to help sustain populations of wood, spotted, and Blanding's turtles. Like the New England Cottontail WLFW initiative, it relies on voluntary management and/or land protection by private landowners in key areas. For turtle conservation, protecting parcels within intact landscapes using Best Management Practices (BMPs) and habitat management are the primary goals. The New Hampshire Fish and Game Department's (NHFG) Nongame and Endangered Wildlife Program has provided on-the-ground assistance in priority and focal core areas, as well as BMPs that have been developed through regional Competitive State Wildlife Grants. The challenges to making rapid progress include the time commitment for site visits and planning, aligning the goals of landowners, NRCS, and NHFG, and how to share and use sensitive data. In New Hampshire, the two agencies have identified ways to best communicate, share information, and use existing NRCS programs such as the WREP (Wetland Reserve Easement Program) and EQIP (Environmental Quality Incentives Program) to benefit turtles. NHFG and three state land trusts were awarded a grant from the National Fish and Wildlife Foundation to directly fund assistance and land acquisition through the Working Lands for Wildlife partnership. The products and results from these efforts will be discussed, as well as lessons learned and options for overcoming data sensitivity issues.

Presenter Bio*: **Josh Megyesy** is a wildlife biologist with New Hampshire Fish and Game's Nongame and Endangered Wildlife Program, with a primary focus on rare and state-listed turtle conservation. Through monitoring populations of Blanding's, spotted, wood, and Eastern box turtles statewide, he has identified specific conservation actions to benefit these species and their associated habitats. More recently, Josh's work has been providing technical assistance and Best Management Practices to landowners and land managers, state and federal agencies, towns, land trusts, and other organizations.*

Session: Forest Habitat Management

Monadnock's Resilient Forests: Impact and Recovery from the 2008 Ice Storm

Peter Palmiotto[*1]; Timbo Maddalena-Lucey[1]; Amber Boland[1]; Hana Kiewicz-Schlansker[1]; Carolyn Susa[1]; and David Mallard[1]*
[1] *Antioch University New England*

Abstract: The impact of climate change on the forests of the Monadnock Region is of great concern. The question we ask is: how resilient are our regional forests to the potential increase in frequency and intensity of ice storms which could result from a wetter, warmer climate? New England's forests have a history of ice storms, such as the severe ice storm of 1998 that left a mosaic of patchy damage across the region. Summarily, the 2008 ice storm on Mount Monadnock varied across the mountain. In 2017, to assess the impact from the 2008 ice storm, we resampled 100 research plots measured after the storm in 2009. Plots were located at 100' intervals from 1800' to 2700' on all aspects of the mountain. We measured tree diameters and crown damage as well as sapling densities by species and the volume of coarse woody material.

The ice storm's greatest impact was located on the eastern and northern aspects of the mountain, with greater impact between 2000' and 2300' in elevation. Although not a forest-replacing disturbance, damage occurred to 35% of the individual trees, with crown damage generally less than 25%. We measured the most severe damage at 1900' and 2400', with 16% of the trees suffering greater than 50% crown loss. Direct mortality due the storm was 6.8%; nine years later, 9.7% of the trees damaged in the storm had died.

The result of this mortality was an in increase in dead biomass and subsequent decrease in overall live biomass as measured by forest basal area, although individual tree recovery as measured by diameter and basal area growth was not significantly affected. Sapling density increased 16.8% over the nine years since the storm. Overall, the impact of what appeared to be a significant icing event on Monadnock in 2008 was minimal. Although the forest experienced substantial crown damage due to the storm, with species such as red maple and American beech apparently not very resistant to damage, we conclude that overall the forest is quite resilient to ice damage.

Presenter Bio*: **Peter Palmiotto** is the Director of the Monadnock Ecological Research and Education (MERE) Project and is on the faculty at Antioch University New England, where he chairs the Environmental Studies Department. He received his Doctorate of Forestry in Ecosystem Ecology from Yale University's School of Forestry and Environmental Studies. His current research involves studying forest population dynamics and seedling ecology in northern hardwood and spruce-fir forests in New Hampshire.*

Session: Mount Monadnock

The Value of Long-Term Research on Common Species: Lessons Learned From the Little Brown Bat (*Myotis lucifugus*)

Scott Reynolds (St. Paul's School)*

Abstract: Wildlife researchers generally focus on short-term studies that will answer questions immediately relevant to the conservation and recovery of threatened or endangered species. This triage-based approach to funding generally does not support the long-term studies that provide the essential demographic information needed to manage the recovery of threatened species. A long-term mark-recapture project in Peterborough, NH highlights the value of this approach. Over a 16-year period (1993-2009), I worked with a maternity colony of little brown bats (*Myotis lucifugus*) each summer, capturing over 7,500 bats and banding 4,630 individuals. Over this same time period, I and several colleagues collected winter population data at known hibernacula throughout New England. When an emergent infectious disease (White-nose Syndrome, or WNS) appeared in 2006, common species such as the little brown bat were suddenly not so common. Populations throughout New England and New York saw dramatic declines in just a few years, and wildlife agencies were scrambling to develop recovery plans for species that just two years prior were considered ubiquitous and beyond risk. The data collected in Peterborough have helped develop models for the recovery of this species, as well as congenerics such as the Northern myotis and the Indiana bat. Although the original focus of this study was to develop an accurate life history model for a common species, many ancillary products have been generated from these data, including modeling the potential impact of climate change on temperate species. These projects suggest that similar studies would be valuable for dealing with current and future issues with regards to bats and other wildlife species.

Presenter Bio: ***Scott Reynolds*** *earned a Ph.D. in Physiological Ecology from Boston University in 2001. He has maintained a career-long focus on the conservation biology of temperate bats, including research on demography, house-bat management, winter ecology, and the impact of wind energy on bat communities. His current research interests remain predominantly focused on field research, with particular emphasis on the post-WNS shifts in bat community composition and population recovery of WNS-impacted species. Dr. Reynolds currently teaches at St. Paul's School, a private boarding school in Concord, NH.*

Session: Wildlife

8000 Years of Vegetation Dynamics at "Thoreau's Bog," Mount Monadnock, New Hampshire

Karen Saunders[*1]*; Hana Kiewicz-Schlansker*[1]*; James Jordan*[1]*; and Peter Palmiotto*[1]
[1]*Antioch University New England*

Abstract: Analysis of modern vegetation and of a sediment core from Thoreau's Bog, located at an elevation of approximately 823 m on Mount Monadnock in southwestern New Hampshire, records bog development and vegetation dynamics under changing climate and disturbance conditions during the past 8,000 years.

Stratified random sampling of dwarf shrub/grass, shrub, and forest zones was done in July 2015. Ten plots were randomly placed within each zone, resulting in 30 total plots around the bog. A 2.5 m core was extracted in April of 2015. Two radiocarbon dates were obtained: 2410 +/- 30 BP (Cal BP 2685 – 2350) at 49 cm from the extracted core's surface, and 7420 +/- 30 BP (Cal BP 8335 – 8180) at 247 cm below the surface. Plant macrofossils, charcoal, and total organic matter content were used as proxies for bog development, peat and organic matter deposition, productivity, water availability, and fire.

Thoreau's Bog is presently characterized by thickets of mountain holly (*Ilex mucronate*) and dense tussocks of tall cottongrass (*Eriophorum angustifolium*) growing on a sphagnum moss substrate, with open water in parts of the bog. The forest surrounding Thoreau's Bog is dominated by red spruce (*Picea rubens*), with paper birch (*Betula papyrifera*) and American mountain ash (*Sorbus americana*) each comprising less than ten percent of the overstory.

Increasing organic matter and gradual changes in macrofossil assemblages in the lower, and older, section of the core indicate a shallow pond environment with a gradually encroaching sphagnum mat. A rapid mid-core shift in the relative abundance of macrofossils indicates a decrease in open water and a change to a sphagnum-dominated community. This is followed by a decrease in sphagnum and an increase in woody vegetation and charcoal, indicating a multi-century drier spell with repeated fires in the vicinity of Thoreau's Bog approximately 3,000 to 4,000 years ago, followed by gradual shifts in vegetation bringing the bog to its present state. Insight into vegetation dynamics and the resilience of Thoreau's Bog during the past 8,000 years will be of use in restoration of other Monadnock wetlands that have been influenced or degraded by human activity.

Presenter Bio*: **Karen Saunders** is a PhD candidate in Environmental Studies at Antioch University New England, with research interests in forest ecology and paleoecology. In addition to investigating Holocene vegetation dynamics of Thoreau's Bog, she is currently investigating the role over time of peat-substrate woodland swamps within larger forest ecosystems, and has published on fire-vegetation interactions within Acadia National Park and Cape Cod National Seashore.*

Session: Mount Monadnock

Norway Pond Sediments: A Historical Resource in Understanding the Pond's Evolving Ecosystem

Thomas Shevenell (Norway Pond Commission) and Lisa Doner (Plymouth State University)*

Abstract: Environmental trends in Norway Pond (Hancock, NH) were assessed over the historical time scale (a 500-year period) using sediment cored from the deepest area of the pond. These trends put current ecological conditions of the pond into perspective and provide insight into how the ecosystem may evolve in the future. This kind of scientific basis supports decision-making, application of best management practices, and implementation of improvements, where practical, in response to water quality or deleterious uses of the pond and its watershed.

Sediments are an ideal archive to document watershed events and longer-term processes, both natural and human-related. Our 50-cm core was divided into 0.5-cm segments for analyses. Major, minor, and trace elements analyses were used in conjunction with other physical analyses to interpret the pond environment over the historical period. Pb210-dating created a time scale with depth in the core. This allowed comparison of geochemical signatures with historical events.

Norway Pond is a shallow (5.5 m) 50-acre mesotrophic pond in the midst of natural succession towards a eutrophic (nutrient-rich) state. Its ultimate condition is expected to be a sediment-filled wetland. Based on Pb210 accumulation data, organic and inorganic matter are infilling the pond at a rate of 4mm/year. At this rate, its demise as an open body of water is estimated to occur in 1,500 years.

The rate of pond succession has increased since the settlement of Hancock, evidenced by increases in sedimentation rate, nutrient loading (phosphorous and nitrogen), and deposition of aquatic-derived organic matter. Human impacts are observable in the sediment record, including effects of regional forest clearing and sheep farming (1764-1840); the construction and operation of the railroad through Hancock (1878-1934); and deposition of trace elements (e.g., lead) transported in the atmosphere from outside the region (circa 1890). The Hurricane of 1938 is identified in chemical indicators of soil leaching (Al, Fe, and Ca) and increased inputs of terrestrial carbon, possibly because the pond was used as a wet storage site for logs over a subsequent 10-year period.

Future research will focus on how the pond ecology evolved since the glacier left this area about 15,000 years ago, to learn how changes in climate may have influenced the natural succession of the pond prior to the arrival of European settlers and the commencement of the Industrial Revolution.

Presenter Bio*: **Tom Shevenell** is retired after owning an environmental consulting business specializing in assessing and delineating commercial and industrial hazardous and petroleum waste sites, and an analytical laboratory specializing in analyses of organic contaminants in environmental samples. Tom holds a Ph.D. in Earth Sciences from UNH, a M.Phil. in Marine Geology from Columbia University, and a B.A. in Geology from UNH.*

Session: Water

Water Quality Monitoring on the Ashuelot River

Barbara Skuly (Ashuelot River Local Advisory Committee)*

Abstract: The Ashuelot River travels 64 miles from its headwaters in Washington, NH to its confluence with the Connecticut River in Hinsdale, NH. Since the passage of the Clean Water Act in 1972, the Ashuelot River has been transformed from a river running many colors to a favorite location for recreation and nature study and a river supporting a healthy aquatic biota. Water quality monitoring is the responsibility of the New Hampshire Department of Environmental Services, yet 40% of New Hampshire river water quality assessments are performed through the Volunteer River Assessment Program (VRAP). Local citizens have collected data on the Ashuelot River since 2000. In this talk, we will take a look at the trends in physical and chemical parameters gathered by citizen scientists on the Ashuelot River, and what the data imply about the health of the river.

Presenter Bio*: **Barbara Skuly** is the chair of the Ashuelot River Local Advisory Committee, a board created through the New Hampshire Rivers Management and Protection Program that provides feedback to the New Hampshire Department of Environmental Studies regarding projects in the Ashuelot River corridor. She is also the coordinator of the Ashuelot River Water Quality Monitoring program, in conjunction with the New Hampshire Volunteer River Assessment Program. Barbara holds an M.S. in Resource Management and Administration from Antioch University New England, is the former chair of the Swanzey Conservation Commission, and is a member of the New Hampshire Rivers Council Board of Directors. She also worked with the New Hampshire River Restoration Task Force on the removal of the Homestead Woolen Dam on the Ashuelot River in Swanzey, and is the recipient of the 2015 Granite State Award.*

Session: Water

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15 Years of Research Observations at Otter Brook Farm

Rick Van de Poll (Ecosystem Management Consultants)*

Abstract: Otter Brook Farm is a 1850-acre private conservation area in Peterborough and Greenfield, NH. Since 2004, the landowners have retained the services of Ecosystem Management Consultants to conduct research and education activities at the Farm and to assist with the conservation of their land. After a two-year survey of the natural resources of the property, an eight-year environmental education program with Harris Center for Conservation Education staff was completed in the ConVal School system. In addition, 20 long-term monitoring plots were established and sampled by the principal investigator with assistance from undergraduate and graduate students from UNH, Plymouth State, and Antioch University New England. Citizen (student) scientists conducted investigations and monitored water quality, soil pH, vegetation, vernal pools, terrestrial salamanders, mammal track transects, small mammal live traps, and fungi. With a healthy amount of direct supervision, the students benefited by learning critical research skills and the Farm benefited by increasing its research capacity. Datasets have been published and presented to UNH EPSCoR, New Hampshire Fish and Game, the New Hampshire Water Conference, the New Hampshire Environmental Educators Alliance, and as yearly reports submitted to the landowners. This short presentation will summarize the results of this 15-year effort and cover findings for each of the primary research projects at the Farm.

Presenter Bio*: **Rick Van de Poll** is the principal of Ecosystem Management Consultants (EMC) of Sandwich, NH. Since 1988, EMC has conducted bio-inventories and completed management plans on over 350,000 acres of public and private land in New England. He is a certified wetland scientist, professional wildlife biologist, and practicing mycologist. He taught for 15 years at Antioch University New England, six years as adjunct faculty at Plymouth State University, and is currently an adult education instructor at UNH. He sits on three governor-appointed committees in New Hampshire, is on the Steering Committee of the New Hampshire Wildlife Coalition, and is President of the Northeastern Mycological Federation.*

Session: Ecological Inventory

Fall Migration of Northern Saw-whet Owls in Southwestern New Hampshire

Chris Volonte (Antioch University New England / Kestrel Land Trust)*

Abstract*:* Non-breeding distributions of secretive and nocturnal species such as Northern Saw-whet Owls (*Aegolius acadicus*) have been largely unknown in New Hampshire, and yet identification of migratory and overwintering habitats is a fundamental management step for the conservation of this owl, a conifer-loving species that may be particularly vulnerable to climate change. To improve regional knowledge of saw-whet owls in New Hampshire, I trapped and banded owls at four locations in Cheshire County during the autumns of 2008, 2009, and 2010. My results showed consistent annual capture rates and a bell-shaped capture pattern, indicating that the populations of owls captured during my study were migrants, with peak passage through this region occurring from the second through the last week of October. My study also provided insights into factors determining this owl's migration routes, suggesting that routes are more strongly influenced by availability of forest cover than by landscape features.

Presenter Bio*: **Chris Volonte** earned an M.S. in Conservation Biology at Antioch University New England, where she did her thesis research on Northern Saw-whet Owl migration. She came to Antioch with twelve years' experience in conservation and education non-profits, and while there, she became interested in land protection and stewardship. Today, as Conservation & Stewardship Manager at Kestrel Land Trust in western Massachusetts, she manages the trust's properties, collaborates with state and municipal partners to create and maintain trails, and bands American Kestrels as part of a statewide nest box program.*

Session: Wildlife