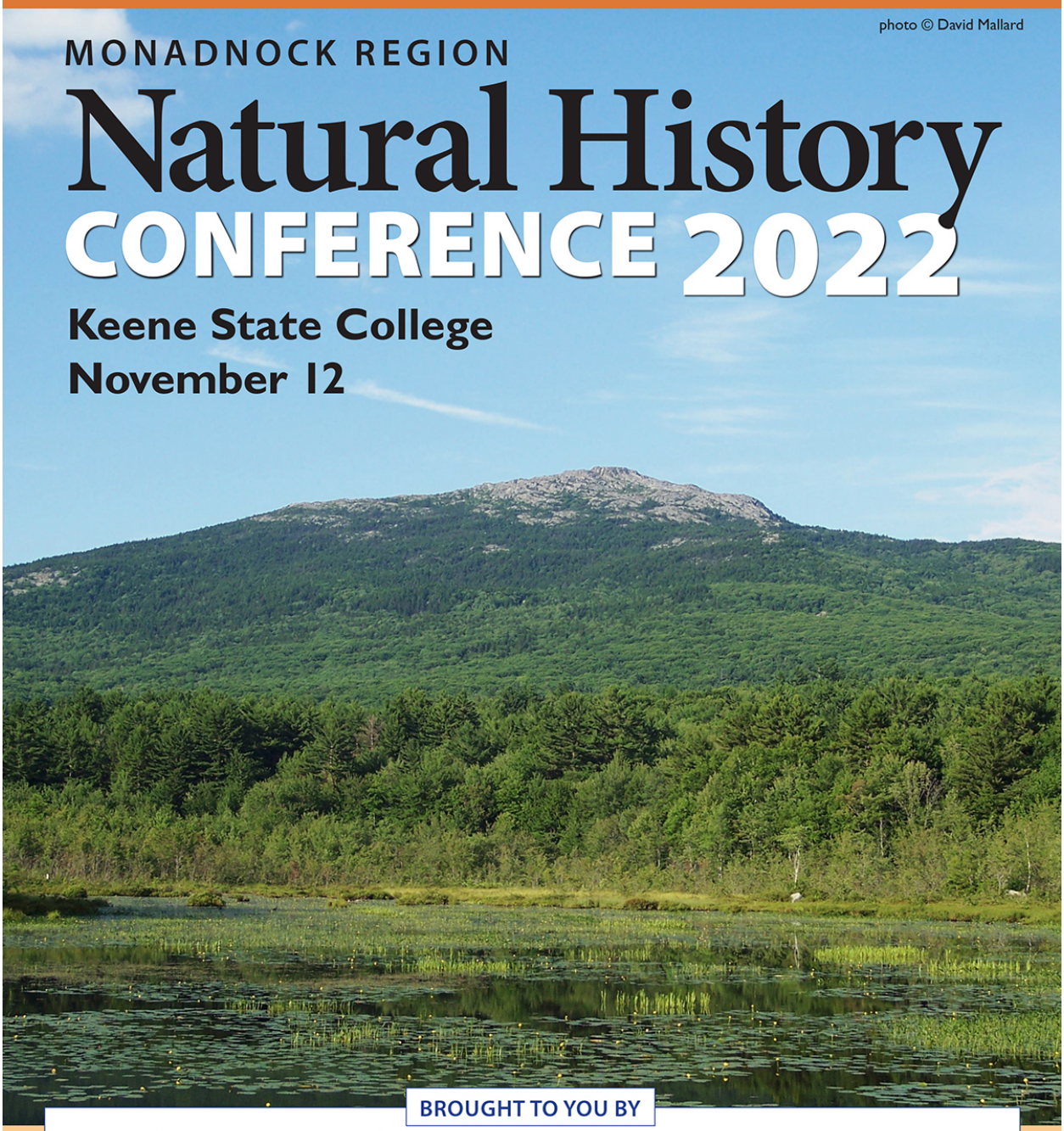
A day for scientists, educators, students, backyard naturalists, and everyone who cares about nature!



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MONADNOCK REGION

Natural History CONFERENCE 2022

Keene State College
November 12

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Oral Presentation Abstracts

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

The Harvard Pisgah Tract: A Century of Forest Research in 20 Minutes

Audrey Barker Plotkin ([1]Harvard Forest), David Foster[1], Anthony D'Amato (University of Vermont) & Emma Sass (University of Massachusetts)*

Abstract: Nestled within Pisgah State Park is a small remnant of never-logged forest. In the early 1900s, researchers from the newly founded Harvard Forest began studying the old-growth forests of southwestern New Hampshire, drawn to the towering white pines and hemlocks. Threatened by imminent logging in the 1920s, Richard T. Fisher, founding director of the Harvard Forest, organized a fundraising campaign to purchase 25 acres of the most magnificent hemlock-white pine-hardwood forest. This tract and an additional hardwood forest of ~50 acres of state land are the only areas that remained uncut.

A century of research on this forest revealed long periods of stability punctuated by major disturbance events. Fisher and his students documented pine and hemlock that began their lives in the 1600s, after a large hurricane in 1635 followed by a fire in 1665. Smaller wind events, occasional fires, and pathogens such as the chestnut blight produced a varied age and size structure across the landscape. Then, the Great Hurricane of 1938 toppled most of the large pines and hemlocks on the Harvard Tract. While most of the region was salvage logged, the fallen canopy on the Harvard Tract remained.

The forest canopy is now more uniform and much smaller in stature, but the pines continue to define the forest through large and persistent tip-up mounds and downed logs. Indeed, the Harvard Tract shows us that you need to look down to see much of what is missing from second-growth forests. Tip-up mounds are favored sites for tree regeneration, especially birches. Carbon stored in the pre-hurricane trees persists for many decades – 50 years after the hurricane, about 30% of the carbon in the downed trees remained.

What does the future hold for the Harvard Tract? Over the past 35 years, the forest has continued to grow and gain in live biomass, although small gaps break up the canopy. Hemlock and beech, the dominant species in the current forest, are threatened by invasive pathogens and insects. Beech bark disease is rampant across the Harvard Tract. Hemlock woolly adelgid is present in low abundance, but will likely increase and start to cause hemlock mortality in the coming decades. While the Harvard Tract will continue to change, it will remain a reference for how forests function without human intervention.

Presenter Bio: Audrey Barker Plotkin is Senior Scientist and Site Manager at Harvard Forest, and Director of the Harvard Forest Summer Research Program in Ecology. Her research delves into long-term forest development, especially how forests respond to disturbances such as wind and insect outbreaks. She has a BA in Biology from Carleton College and an MS in Forestry from the University of Maine, where she focused on forest ecology and silviculture. She is pursuing a PhD in Environmental Conservation in the Spatial Ecology Lab at the University of Massachusetts. She is also involved in land management as a Massachusetts-licensed forester.

Session: Forest Ecology

Keene as Kosmos: The Natural and Literary History of the Monadnock Region

Matthew Myer Boulton (SALT Project)*

Abstract: This talk will be a 20-minute romp through selected highlights of the "deep local history" of both Keene and the Monadnock Region more generally, with special emphasis on three levels of analysis: natural history; human history, focusing on ecological patterns and impact from Abenaki settlements to present; and literary/artistic history, underscoring how the arts have often been inspired by the living world (including Thoreau, Thayer, Twain, Cather, Wilder, and Kumin).

The presentation will be shaped by three underlying premises. First, following Wendell Berry's emphasis on "affection" as a key driver of effective conservation, the talk will emphasize aspects of the region's natural and literary history that can help us appreciate and admire the place we call home. Second, while recent decades have seen increasing specialization of knowledge within particular fields and subfields, more generalist and interdisciplinary approaches have offered a welcome counterpoint – and this talk is structured accordingly. And third, the talk will be tailored to the "deep local history" highlights most likely to be both memorable and perception-shifting for a general audience.

For example, understanding the fundamentals of how Mount Monadnock was formed, and why its summit is devoid of trees (debunking the myth about farmers and wolves!), can help us see the mountain with new eyes when we catch sight of it on the horizon. Or again, learning that Thoreau's mother spent most of her childhood in Keene (just down the street from the conference!), and that she had a significant influence on Henry's love of nature, can help us celebrate the local roots of Thoreau's work. From another angle, uncovering the history of Keene's namesake – Sir Benjamin Keene – can help us grapple with our connections to both the

international timber trade and transatlantic enslavement. And appreciating how the region became a magnet for artists, themselves often drawn by the area's ecological beauty, can help us see features in the landscape we might otherwise overlook.

A 20-minute talk will only touch on these fascinating stories, of course – but at the same time, the wide-angle, interdisciplinary view they provide can give us a broad framework for understanding, treasuring, and caring for the place we call home. As William Faulkner once put it, "The past is never dead. It's not even past."

Presenter Bio: Matthew Myer Boulton is a writer and filmmaker living in Keene, New Hampshire. With his wife, Liz, he runs SALT Project, an Emmy Award-winning film and animation production company. His work explores the connections between the ecological sciences and the humanities, including philosophy, theology, and literature. Educated at Northwestern University, Harvard University, and the University of Chicago, he has served on the faculty at Harvard Divinity School, as well as at theological schools in New England and the Midwest.

Session: Sense of Place

Nest Monitoring and Tagging of Monadnock Region Broad-winged Hawks

Phil Brown (Harris Center for Conservation Education)*

Abstract: The Broad-winged Hawk, despite its familiarity as a common raptor of the Monadnock Region during the summer breeding season, is a poorly understood species throughout much of its life cycle. During the breeding seasons of 2021 and 2022, Harris Center staff and volunteers spent hundreds of hours finding and monitoring Broad-winged Hawk nests through a collaboration with Hawk Mountain Sanctuary, which conducted subsequent trapping and tagging of several adult hawks. Five adult Broad-winged Hawks were successfully trapped and outfitted with cellular or satellite transmitters and now provide a sample representation of migratory routes, wintering sites, and breeding territories of individuals within the New England breeding population. The findings yield critical information about habitat selection and demonstrate differences in migration timing and wintering ecology from other populations of this species in eastern North America. Through transmitters and the nest monitoring component, conservation biologists have learned critical information necessary to better conserve this emblematic woodland raptor.

Presenter Bio: Phil Brown has been fascinated with birds from an early age. During and after undergraduate studies at Rutgers University, he pursued a career in natural resource management, initially in urban settings. In 2004, he moved to New Hampshire, where he managed wildlife sanctuaries for NH Audubon for 17 years, ultimately as their Director of Land Management. In 2006, he moved to the Monadnock Region to study Conservation Biology at Antioch University New England while continuing to work for NH Audubon. Soon afterward, he added the role of Pack Monadnock Raptor Observatory Coordinator to his job responsibilities, work he still does as the Harris Center's Director of Bird Conservation. His current role as Bird Conservation Director and Land Specialist at the Harris Center has expanded to include other bird (especially raptor) monitoring projects, community education programming, and land stewardship. He also leads birding and nature tours for a variety of organizations.

Session: Wildlife II

Can We Predict Carnivore Abundance Across New Hampshire? Preliminary Results and Future Directions

Andrew Butler ([1]University of New Hampshire), Mairi Poisson[1], Daniel Bergeron ([2]New Hampshire Fish and Game Department), Patrick Tate [2] & Remington Moll [1]*

Abstract: In addition to their social and cultural value, carnivores play important roles in New Hampshire's ecosystems. Traditionally, trapping data has been the primary method of monitoring carnivore populations over time and space. However, the utility of trapping data can be limited due to diverse factors, such as variation in the number, distribution, and effort of trappers. Therefore, wildlife managers may benefit from alternative methods of monitoring carnivore distribution and abundance across space and time. We will present an overview of a new research project that aims to 1) estimate carnivore density using trail cameras; 2) quantify carnivore-habitat relationships and predict densities across New Hampshire; and 3) compare population-level density estimates from this study to current population monitoring methods. We will present preliminary results from this project, including the carnivore species that were detected in the Monadnock Region during the first year of the study and the number of detections for each species. In addition, we will present results on the density, habitat relationships, and predicted landscape densities for bobcat, coyote, and red fox from a pilot study conducted in 2021 in southeastern New Hampshire. We will conclude with our plans for

future research in the Monadnock Region, and a look at how the information from our study could be used for effective wildlife management.

Presenter Bio: Andrew Butler received his BS in Zoology from UNH in 2011 and his MS in Wildlife Biology from Clemson in 2019. He is now a PhD student at the University of New Hampshire, where his dissertation research focuses on the ecology and management of carnivores in New Hampshire.

Session: Wildlife I

Common Loons and Climate Change: Responding in the Monadnock Region

John Cooley, Jr. (Loon Preservation Committee)*

Abstract: Rapid climate change is forecast to reduce or eliminate the suitable climate niche for Common Loons in the United States in coming decades. What will this mean in the Monadnock Region? After more than four decades of loon recovery efforts in New Hampshire, we outline the evidence for specific climate impacts from a retrospective analysis of annual monitoring data, and interpret those findings for southwestern New Hampshire. We also highlight immediate measures, already underway on local lakes, to mount a response, anticipating and mitigating climate change impacts to loons.

Presenter Bio: John Cooley, Jr. is a Senior Biologist with the Loon Preservation Committee, where he has coordinated field monitoring, nest site management, and loon rescues throughout New Hampshire since 2005. He holds a master's degree in Conservation Biology from Antioch University New England.

Session: Wildlife II

To Fence or Not to Fence: Controlling Deer Browse in Regional Forests – A Seven-Year Update

Hannah Cuzner ([1]Antioch University New England), Hana Kiewicz-Schlansker[1], Merillee Frable[1], Peter Palmiotto[1]* & Rick Brackett (Monadnock Conservancy)*

Abstract: White-tailed deer (*Odocoileus virginianus)* populations have grown rapidly across the mid-Atlantic and Northeastern forests in the past decades, where they can have significant effects on forest composition and growth due to their browsing of young woody vegetation, especially when their populations are high. We report updated findings from a study examining the effects of deer-fenced areas and beech control treatments on forest regeneration in a hardwood forest seven years after treatment. In 2014, research plots were established in six patch-cuts 1–1.5 acres in size in the Maynard Forest in Gilsum, NH. 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 in 2014, 2015, and 2021. The 2021 results indicate that fencing plays an important role in excluding deer from an area, thus allowing the natural succession of woody regeneration. The fenced areas were effective in limiting browsing impacts on the woody regeneration, allowing tree species to grow above browsing height (> 2m). American beech, black birch, pin cherry, and paper birch were the most abundant species that grew above browse height. Red maple was the most abundant species overall, with the majority of the seedlings under 0.5 m tall, followed by American beech and red oak. In the unfenced area, American beech had the highest browse impact, followed by red oak and red maple. It's clear that fencing limited the amount of deer browse, and allowed species and the forest to grow unimpeded.

Presenter Bios: Hannah Cuzner is a recent graduate of Franklin Pierce University, with a bachelor's degree in Environmental Science. She is now finishing her master's degree in Conservation Biology at Antioch University New England. She joined this long-term study of deer browse in regional forests in 2021.

Peter Palmiotto received his Doctorate of Forestry in Ecosystem Ecology from Yale University's School of Forestry and Environmental Studies. He has conducted forest ecology research in Chile, Puerto Rico, Indonesia, Malaysia, and the northeastern US. His current research involves studying the population and seedling ecology of northern hardwood and spruce-fir forests in New England. Peter is Chair of the Environmental Studies Department at Antioch University, Director of the Monadnock Ecological Research and Education Project, Director of Antioch University Forests, and co-director of the Antioch Spatial Analysis Lab, which provides opportunities for graduate student capstone projects and internships in ecological research, forest management, and environmental education. He is also a certified professional forester

and a member of the Walpole Conservation Commissioner who brings decades of field experience into the classroom and his community service roles.

Session: Forest Ecology

The New Hampshire Butterfly Monitoring Project

Heidi Holman (New Hampshire Fish and Game Department, Nongame and Endangered Species Program) & Mark Ellingwood* (New Hampshire Fish and Game Department, Wildlife Division-Retired)*

Abstract: New Hampshire Fish and Game's Nongame and Endangered Species Program is broadly invested in pollinator and butterfly conservation. Program activities include threatened and endangered species research and conservation, habitat management and protection, and public education, outreach, and engagement. The New Hampshire Butterfly Monitoring Project is a new citizen science initiative designed to annually quantify butterfly distribution and abundance in New Hampshire, and to further promote public interest in the 100+ butterfly species that occur in the Granite State. This presentation will describe a partnership between the Nongame and Endangered Species Program and the Harris Center for Conservation Education to initiate annual butterfly surveys in the Monadnock Region. The presenters will also discuss how the New Hampshire Butterfly Monitoring Project is being expanded to include the establishment of new regional survey efforts, survey methods, and expected outputs over time.

Presenter Bios: Heidi Holman is a supervising wildlife biologist for NH Fish and Game's Nongame and Endangered Species Program, where she oversees multiple butterfly and mammal projects. Mark Ellingwood is a retired wildlife biologist, the retired Wildlife Division Chief for NH Fish and Game, and an active volunteer with NH Fish and Game's Butterfly Monitoring Project.

Session: Wildlife II

Forest Carbon and Resilience in Cheshire County

Matthew Kelly (UNH Cooperative Extension)*

Abstract: The forests of Cheshire County provide numerous ecosystem goods and services, including essential habitat for wildlife, valuable timber products that support local and regional

economies, recreational opportunities, and aesthetic qualities. They also absorb CO2 and store carbon through the process of photosynthesis, which has an important role in the fight against climate change. However, our forests are also being impacted by climate change. This talk will focus on various topics related to forest carbon and climate change, including the science of forest carbon, forest carbon stocking within Cheshire County, the impacts of climate change on forests in the region, and strategies to manage forests for carbon benefits and climate change resilience.

Presenter Bio: Matt Kelly is the Cheshire County Forester for UNH Cooperative Extension. He also serves as the state lead for the Securing Northeast Forest Carbon program. Matt earned his MS and PhD degrees in Forest Resources Management from SUNY-ESF. Prior to his current position, he served on the faculty of Michigan Technological University, where he taught courses in forestry and natural resources management and conducted research on various forestry-related topics.

Session: Forest Ecology

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eBird Atlas for the Monadnock Region: 2000 - 2020

Steven Lamonde (Antioch University New England)*

Abstract: Since the 1970s, breeding bird atlases have provided important local data on the distribution of bird species during the breeding season. These atlas efforts, when repeated every 20 or 30 years, carefully document population range shifts caused by climate change and habitat losses and gains. New Hampshire's first, and only, breeding bird atlas was completed in 1986 – nearly 40 years ago. In this time, some bird populations have changed drastically, yet a formal atlas effort thoroughly investigating these changes has not been attempted. With the creation of eBird, a global community science database for bird sightings, researchers can produce pseudo-atlases of not just breeding bird populations, but migrating and winter populations as well. While not as thorough as a dedicated atlas effort, an atlas produced from eBird data can be used to inspire local birding, raise awareness and support for a true atlas, study geographic and seasonal trends in human birding behavior, and begin to identify important local places that support threatened species and overall bird diversity. Using eBird data from 2000-2020, data manipulation tools in R, and cartography in ArcGIS Pro, I have begun mapping distributions of over 220 species in Cheshire and Hillsborough counties at the town scale and atlas block scale (approximately nine square miles). Species richness and occurrence are mapped by season, as

well as birding effort in terms of total party hours and total eBird checklists. This project will generate over 1,100 detailed maps, of which a small, representative sample will be presented.

Presenter Bio: An avid birder, Steven Lamonde is an affiliate professor at Antioch University New England, where he teaches graduate-level GIS courses. He is also a full-time ecologist with Moosewood Ecological LLC, where he works closely with town conservation commissions and conservation-minded landowners through New Hampshire.

Session: Wildlife II

Building Better Relationships with Nature

Clara Mbasisya (Keene State College)*

Abstract: The need for environmental literacy is becoming ever greater as the world faces the crisis of climate change. Overcoming this challenge requires everyone to contribute, yet millions of people are still unaware of the necessity for action. This inspires many questions such as: How do we help people, in the Monadnock Region and around the world, develop better relationships with the natural world? How do we transform conversations about sustainability and climate resiliency into actions? Are there communities that have been able to achieve these goals? If so, how can we learn from them?

To address these questions, my project takes inspiration from Indigenous cultures around the world, who are known for sustainable ways of life that are deeply linked to their strong sense of place. What can we learn from them, to help move our society toward climate resiliency and sustainability in general?

In this presentation, I will describe the work I have done to set myself on the course of developing my sense of place rooted in a relationship with the land. Initially, I was skeptical that I would be able to develop a meaningful relationship with nature as a result of this project, considering that I am working in a foreign context. How do I develop a real sense of place while living on a land that is not my own, speaking a language that is not my own, living with people who do not look like me? As an environmental student, I was willing to evaluate the usefulness of this challenge for environmental education.

This project was conducted in Manchester, New Hampshire – the closest urban neighbor of the Monadnock Region. I visited Milestone Brook, which passes through the city, as my observation site. I noted the natural changes of the brook each week, including taking

photographs and learning to identify plants and animal sign at this location. I shared my reflections with whoever wanted to hear.

One year later, the results of the project left me convinced that all of my concerns were merely assumptions and that we can very well create a deep connection to nature regardless of the context we find ourselves in. I am also convinced that this exercise can be reproduced everywhere in the world for environmental education both in and outside the classroom. In the end, I came to realize that nature does start right outside the door, and we can develop a strong relationship with nature with way less than we usually think we need.

Presenter Bio: Clara Mbasisya is an international student from the Democratic Republic of Congo and a senior at Keene State College, where she is majoring in Environmental Studies and Sustainability. She has been working on building a sense of place through her yearlong challenge of making weekly observations of the Milestone Brook in Manchester, New Hampshire. Her environmental work in Congo is known as the BlueGreen project, which she will be presenting in her senior seminar class in December 2022. Through the BlueGreen project, she has been able to coordinate actions such as creating school gardens, offering agricultural workshops for more than 200 high school students, offering afforestation workshops for farmers, coordinating tree-planting campaigns, and more.

Session: Sense of Place

New Hampshire's Wood and Eastern Box Turtles: Research and Conservation

Josh Megyesy (New Hampshire Fish and Game Department)*

Abstract: In this presentation, I will discuss active research underway for wood turtles (*Glyptemys insculpta*), a Species of Special Concern, and Eastern box turtles (*Terrapene carolina carolina*), a state-endangered species. With various grants and other funding, populations of both species are being monitored through regionally standardized surveys, radio telemetry, microchipping, and specialized scent dogs. I will talk about the threats to these turtles and the conservation challenges in fast-developing parts of the state. Other topics will include headstarting, land protection, habitat management, and landowner partnerships.

Presenter Bio: Josh Megyesy has been a wildlife biologist with NH Fish and Game's Nongame and Endangered Wildlife Program for more than ten years, where he focuses on reptiles and amphibians. His specialty is conservation of at-risk turtle species, and he works statewide with

wood, Blanding's, spotted, and Eastern box turtles. Josh also helps coordinate the Reptile and Amphibian Reporting Program (RAARP) and engages with the public through outreach, presentations, and landowner site visits where conservation actions may benefit rare turtles.

Session: Wildlife I

The Biodiversity Heritage Library: Collaborating on Open Science

Constance Rinaldo (Biodiversity Heritage Library and Smithsonian Institution)*

Abstract: Natural history literature and archives contain information that is critical to studying life on Earth. The Biodiversity Heritage Library (BHL) is an established and successful digital library, formed by a global consortium of natural history libraries, herbaria, universities, and museums. BHL has more than 60 million pages of global natural history literature from the 15th to 21st centuries and is openly available to all: students, community scientists investigating endangered species, specialists in taxonomy and systematics, and those interested in habitat management, disease control, and maintenance of ecosystems services. BHL collections of digitized books and field notes include species descriptions, distribution records, historic climate records, history of scientific discovery, scientific observations, taxonomic names, and beautiful scientific illustrations. Publications and archives may be the only remaining record for an extinct species or the only record of specimens which have been destroyed.

BHL inspires discovery through free access to biodiversity knowledge. BHL works collaboratively to make biodiversity literature openly available to the world as part of a global biodiversity community. The extensive global partnerships, curated content, full-text searching, innovative tools and services, and ease of mining data establish an open science resource that advances scientific progress.

The natural strengths of BHL's virtual organization include social distancing, virtual collaboration, and opening up science; the pandemic world has been a natural ecosystem for BHL partners, since BHL was founded as a global, dispersed, and virtual library. Museum scientists in particular relied on BHL content to continue their work remotely during pandemic-related shutdowns.

As an international consortium, BHL provides rich open access collections to the larger biodiversity community. BHL services and tools can benefit naturalists, community scientists, or anyone interested in biodiversity. Thanks to the efforts of countless volunteers who have transcribed field notes, corrected optical character recognition, and assigned taxonomic tags,

BHL has opened access to data that has been nearly impossible to extract from print collections of museum libraries and archives.

This talk is designed to introduce interested communities to the tools, services, and data in BHL and how contributions of volunteers improve discoverability through crowdsourcing projects.

Presenter Bio: Constance Rinaldo was the Librarian of the Ernst Mayr Library & Archives of the Museum of Comparative Zoology at Harvard University from 1999 to 2021. She was also a founding member of the Biodiversity Heritage Library, where she worked with an international consortium of natural history and botanical libraries to digitize the taxonomic literature. She held a BA in Biology and Anthropology from the University of Massachusetts–Boston, an MSc in Zoology from the University of Connecticut, and an MLS from the University of Maryland. Before Harvard, Connie spent 10 years as the Head of Collections in the Biomedical Libraries at Dartmouth College and along with her MLS work, was an assistant in the National Text Digitizing project at the National Agricultural Library, an early digitization project. Connie was passionate about biodiversity and natural history. She worked with local, national and global partners to make library and archives collections connected, open, accessible for all.

Session: Sense of Place

Retaining Ash on Our Landscape: The Importance of Seedlings and Seed Years

Gabriel Roxby (Society for the Protection of New Hampshire Forests)*

Abstract: Our native ash trees are facing a bleak future due to the rapid and devastating spread of emerald ash borer (EAB), an invasive forest pest. Currently, the best hope to retain ash on our landscape is through the introduction and establishment of biocontrol insects. However, EAB has a head start, and the biocontrol insects do not have much chance of stopping the initial killing front of EAB before most of our large ash trees are wiped out.

EAB does not seem to affect smaller diameter trees, however, offering an opportunity to retain young ash on the landscape for a few decades and allow the biocontrol insects to become better established. This talk will outline some of the recent thinking that Forest Society foresters have undertaken in an attempt to manage for young ash trees. We took the first steps of an ash regeneration project this fall on Mount Monadnock by flagging female ash trees, and will share some lessons learned and our plans for a future timber harvest. The fall of 2022 was

an ash seed year across much of the Monadnock Region, meaning that landowners may start to see ash seedlings in the understory of their forests next spring. Careful thought and management of these seedlings could provide ash a greater chance of surviving in our region.

Presenter Bio: Gabe Roxby has been a field forester with the Forest Society since 2012, when he graduated from the University of New Hampshire with an MS in Natural Resources and a focus in Forestry. He attained his New Hampshire forestry license in 2019, and works with the other foresters on the Forest Society staff to manage their nearly 60,000 acres of land throughout the state. Gabe previously worked for the Student Conservation Association building and maintaining trails and educating elementary school students about the joys of science. He enjoys learning about the complexity of our forests in New Hampshire and talking about sustainable forest management with anyone who will listen.

Session: Forest Ecology

Thoreau on Monadnock: Long on Botany and Philosophy, Short on Geology

*Peter J. Thompson * (Dartmouth College)*

Abstract: Thoreau visited Mount Monadnock four times between 1844 and 1860. His journal writings from two of those trips are replete with descriptions of the flora, fauna, and landforms on the mountain. He described the coarse gravelly soil, the "regularly stratified rocks," the bogs, and the cliffs, which he noted as being mostly on the southeast side. Using the crude method of hurling a stick ahead of him to estimate distances, Thoreau produced a fair map of the mountain with its "buttresses and spurs." He sketched and measured glacial striae without speculating as to their origin, and noted "large boulders, left just on the edge . . . as if the Titans were in the very act of transporting them when they were interrupted." He had read Jackson's 1844 account of Monadnock geology ("mica slate and garnet-bearing gneiss") and was thus likely influenced by Jackson's hostility toward Agassiz's recent hypotheses regarding glacial striae and drift. Even Edward Hitchcock, in his classic 1856 discussion of "drift unmodified and drift modified," preferred iceberg transport to explain erratics, and glacial theory did not achieve widespread acceptance until the following decade.

Perhaps Thoreau's most original observations have to do with the water budget on Monadnock, centered on the bog which bears his name, where he debated the balance between rain, fog, evaporation, underground springs, and streams flowing away from the Connecticut-Merrimack divide. He described orographic cloud formation in stunning detail.

However, he made no mention of the conspicuous sillimanite pseudomorphs after andalusite, which according to Jackson give the rock a "porphyritic appearance," nor of the great isoclinal fold exposed on the west-facing cliff near the summit. Even more curious, given the Thoreau family pencil business, is the omission of reference to a graphite mine that operated on the mountain from 1847 to 1850! Was his visit to Monadnock in part a business trip at a time when the Thoreaus were negotiating a secret deal with Smith and McDougal of Boston?

Much of the rest of his accounts emphasized botany and philosophical musings. He was evidently much more interested in plants and the "science which deals with the higher law" than in geology. Significantly, in declining membership in the American Association for the Advancement of Science he described himself as "a mystic, a transcendentalist, and a natural philosopher to boot."

Presenter Bio: Peter J. Thompson is a retired geology professor, who taught at both Cornell College and the University of New Hampshire. He is also a bedrock mapping consultant for the New Hampshire Geological Survey and a visiting scholar at Dartmouth College.

Session: Sense of Place

New Hampshire Fish and Game's Nongame & Endangered Wildlife Program, Projects, and How You Can Help

Melissa Winters (New Hampshire Fish and Game Department-Nongame and Endangered Species Program)*

Abstract: Did you know that New Hampshire Fish and Game's Nongame and Endangered Wildlife Program works to protect over 400 species of mammals, birds, reptiles, and amphibians, as well as thousands of insects and other invertebrates? We do this through research and wildlife management and monitoring, as well as by providing education and outreach. We also provide technical assistance to towns, organizations, universities, private landowners, and federal and state partners on habitat management for priority species and conservation actions. While focusing on local management goals and objectives, we also participate with other states and regions, as well as international partners. This talk will introduce the program and some of our key partners, as well as current research and project highlights, who we work with, and ways that you can help.

Presenter Bio: Melissa Winters is a Certified Wildlife Biologist with NH Fish and Game's Nongame and Endangered Wildlife Program, where she oversees conservation efforts for several species of reptiles, amphibians, freshwater mussels, and tiger beetles. She also manages the Environmental Review Unit. Melissa received her MS in 2007 and her BS in 2000, both from the University of Wisconsin–Stevens Point. She has extensive background working with a variety of wildlife, including state and federally listed species, in both the private and public sectors throughout the Midwest, California, Texas, and the Northeast.

Session: Wildlife 1

Spots to the Left, Right, or Center? Dorsal Spot Patterns and Symmetry in Spotted Salamanders (*Ambystoma maculatum*) of the Monadnock Region of Southern New Hampshire

*M. Ryan Woodcock * ([1]Medaille University at Buffalo NY), Daniel Alvarado[1], Angelica Bartkowiak[1], Jay Bortel[1], Caitlin Bruscia[1], Alexa Daley[1], Jenna Daniel[1], Brittani Diamond[1], Cassidy Fleming[1], Marissa Gaughan[1], Alan Johannes [1], Rebecca Lesser[1], Emma McElligott[1], Samantha Morcio[1], Miranda Van Hout [1], Nina Zulawski[1] & Brett Amy Thelen (Harris Center for Conservation Education)*

Abstract: Spotted salamanders (*Ambystoma maculatum*) are an iconic species characterized by a dark body distinctively pigmented with a paired sequence of bright yellow-to-orange spots. These spots are a convergent trait occurring in multiple distantly related woodland salamander species. This discovery-driven research project attempted to clarify the natural selective pressures in operation through an analysis of pigmentation patterns found among spotted salamanders in the Monadnock Region of southern New Hampshire. In collaboration with the Harris Center for Conservation Education, the research team was provided access to an extensive photo archive of spotted salamanders documented during their annual migrations from 2015-2019. These images were divided up among a team of fifteen students, who measured the number of spots on ten major body regions of each salamander. Our primary research questions were: Do spots exhibit a pattern of inheritance, and does the symmetry and/or frequency of spots indicate a pattern of natural selection? Analyses revealed that left and right dorsal spot numbers were directly proportional. Total spots for each salamander were statistically examined for evidence of asymmetry (left-or-right bias). A strong occurrence of symmetrical spotting was observed for the majority (99.7%) of the population. The total number of spots in the population produced a bell-shaped distribution, indicating that

pigmentation was controlled by multiple genes. Statistical analyses further revealed that more salamanders were found with average spotting than would be expected by chance alone, indicating strong stabilizing selection. We propose that this stabilizing selection may represent a selective compromise: the salamanders benefit from spot patterns that are conspicuous enough to warn away would-be predators, but not so conspicuous as to draw the attention of salamander-adapted predators.

Presenter Bio: Dr. Ryan Woodcock is a a broadly-trained geneticist and bioinformaticist, and a new faculty and program director for Biology at Medaille University, a non-profit school in Buffalo, New York. His previous research has included species descriptions of insects, the study of gene regulation in fruit flies, and the long-term conservation genetics and management of the endangered axolotl salamander. In 2017, he completed a research-and-teaching postdoc in Cell Biology at Keene State College under the mentorship of Dr. Jason Pellettieri. The research presented here was made possible in cooperation with the Harris Center for Conservation Education and represents a class project for a herpetology lab completed during the coronavirus pandemic lockdown of 2021. While he is new to our community, Dr. Woodcock has already developed a strong appreciation for the value of discovery-driven laboratory investigations to make meaningful scientific experiences accessible to students.

Session: Wildlife 1

POSTER PRESENTATION ABSTRACTS

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

Bees in the Bogs: Preliminary Findings on Wild Bee Assemblages of Southern New Hampshire Peatlands

Alaina Bandanza ([1]Antioch University New England), Joan Milam (University of Massachusetts-Amherst) & Mike Akresh[1]*

Abstract: New Hampshire is home to an array of climate-vulnerable peatlands, and these unique wetlands host an abundance of diverse flora and fauna and often threatened species, including bees. Bees are the foremost pollinators in most environments in North America and also act as valuable indicators of overall ecosystem health. Native bees are in decline and a recent study suggests that 14 species of bees are believed to have declined significantly in New Hampshire in the past 125 years. In New England, information on native bee ecology and floral associations in wetlands and peatlands is currently unknown, hindering effective conservation and management of both peatlands and native bees. In 2021, we assessed wild bee diversity and abundance in ten New Hampshire peatlands and examined differences in relation to habitat type, floral community characteristics, and distance to forest edge. We set thirteen 90-m bee bowl transects within ten peatland sites. We sampled three times over the season (May, July, and August) in combination with time-constrained manual netting on flowering vegetation to supplement bee bowl capture and collect floral interaction data. In 2021, we collected approximately 400 bees of ~70 species. We observed higher bee abundance within peatlands compared to the adjacent forest and captured fewer bees in peatlands with partially closed or fully closed canopy compared to open-canopy sites. Across all sites, hand netting bees on plants that were in bloom yielded the greatest abundance from white meadowsweet (*Spiraea alba*), leatherleaf (*Chamaedaphne calyculata*), and highbush blueberry (*Vaccinium corymbosum*). We also found some noteworthy species in Cheshire County, including *Bombus terricola,* which is a Species of Special Concern and Greatest Conservation Need in New Hampshire. Our findings will help to fill the gap in fundamental knowledge and support the conservation and management of bees in peatland habitats.

Presenter Bio: Alaina Bandanza is an MS candidate in the Conservation Biology program at Antioch University New England. She is broadly interested in the study and conservation of insects, specifically pollinators and native beneficial insects. In addition to the bee research featured in

today's presentation, Alaina has previously assisted with projects focused on ants, moths, and the censusing of pollinator habitats in Massachusetts.

Effects of Historic and Ongoing Phosphorus Inputs from Treated Wastewater Effluent on a Freshwater Emergent Marsh, Rindge, NH

Linda Barriere ([1] Franklin Pierce University), Catherine Owen Koning[1] & Shannon Stroble[1]*

Abstract: This study investigated the connection between total phosphorus (TP) in wastewater inputs and soil and invasive plant species distribution in a freshwater emergent marsh. For forty years, the marsh received treated effluent from the wastewater treatment facility (WWTF) at Franklin Pierce University (FPU), via surface inputs. Aerial photographs show the expansion of the invasive common reed, *Phragmites australis*, over that time period. In 2009, the WWTF switched to a groundwater infiltration system. Surface monitoring shows that the marsh continues to release high levels of total phosphorus.

The goals of this study were to determine if there is a correlation between TP in soil or surface water with *P. australis* stands, and to compare soil phosphorus in this wetland with similar wetlands in the watershed. Three surface soil samples and one water sample were collected, and vegetation was quantified, at 18 locations in the wetland, half with *Phragmites* and half with only native vegetation. Three composite soil samples were also taken from six local marshes not affected by phosphorus pollution. Subsurface samples were taken from all sites, to determine total phosphorus sorption capacity. All samples were analyzed for total phosphorus, water samples using EPA Method 365.2 and soil samples using the ingestion method. Results showed that while TP (in kg/ha) was higher in the *Phragmites* areas, the difference was not significant, and there was no significant difference in TP in the water samples. Areas in the wetland nearer to the existing wastewater filter inputs do have higher TP in soil and water than other areas in the same wetland, and significantly higher specific conductances. Wetland areas with no history of phosphorus pollution had significantly higher soil TP than the FPU wetland with historic and ongoing treated wastewater inputs.

Presenter Bio: Linda Barriere is pursuing a BS in Biology and Environmental Science at Franklin Pierce University. She is also a National Science Foundation Scholar.

The Ongoing Effects of Buckthorn on Understory Plant Communities in a Southwest New Hampshire Pine Forest

Nolan Oppelt ([1]Franklin Pierce University) & Rhine Singleton[1]*

Abstract: In 2003, a long-term study was initiated in natural areas on the Franklin Pierce University campus in Rindge, NH to investigate possible effects of the invasive shrub glossy buckthorn (*Frangula alnus*) on native plant communities. A resulting publication from 2013 identified white pine forests growing on wet soils as the forest type most likely to be impacted by buckthorn. This poster will present results from a 2022 study in which permanent plots from this ongoing study were again re-sampled to monitor possible impacts of buckthorn on forest understory plants.

Presenter Bio: Nolan Oppelt is a senior at Franklin Pierce University, majoring in Environmental Science. He is currently studying possible impacts of glossy buckthorn on forest understory communities.

A Simplified Lidar Approach to Identify Likely Vernal Pools

Jessica Pollack ([1]Antioch University New England), Megan Cahill[1] & Steven Lamonde[1]*

Abstract: Vernal pool-dwelling amphibians play an important role in the Monadnock Region's forested ecosystems, yet their populations are susceptible to localized habitat loss and degradation. As such, the discovery, documentation, and protection of vernal pools is critical to the persistence of spotted salamanders, wood frogs, and other vernal pool obligates. Given their small size and unpredictable occurrence on the landscape, finding vernal pools can be difficult. However, remote sensing technology holds great potential for enhanced wetland mapping and inventory, including vernal pools. In this study, a LiDAR-based potential vernal pool model was created using ArcGIS 10.8.1 to detect and map potential locations of vernal pools on Harris Center for Conservation Education lands in southwestern New Hampshire. Using a combination of predictive modeling and ground-truthing field surveys, the first phase of our project developed a potential vernal pool model based on depression area, forest cover, and distance from wetlands. This initial model was applied to the Harris Center's 74-acre Willard Pond Brook property, where 6,258 depressions, 16 likely vernal pools, and one confirmed vernal pool were identified. Phase two of our study sought to a) refine the potential vernal pool model by additionally accounting for depression volume and depth, and b) develop an objective, numeric ranking index to aid in the prioritization of potential vernal pools for field investigation. Preliminary testing of our vernal pool likelihood index (VePLI) at the

Harris Center's Granite Lake Headwaters property and neighboring Wilson's Tavern conservation land reveals some 48,000 depressions and over 6,000 potential vernal pools. Further refinement of VePLI will enable Harris Center volunteers to find vernal pools more efficiently throughout the Monadnock Region, contributing to our growing documentation of these important amphibian breeding sites.

Presenter Bio: Jessica Pollack is a master's student at Antioch University New England, where she is pursuing a degree in Environmental Studies with a focus in Conservation Biology.

Creative Conservation: Inspiring Others Through Stories of Community Science

Diana Renn (Creature Conserve)*

Abstract: When researchers engage people in community science projects, the ripple effects can be far-reaching. Participants can become less intimidated by science, more aware of the work that wildlife biologists do, curious about wildlife and plants in their own community spaces, and passionate about protecting the environment. They may even be more motivated to donate time, money, or skills to this work, which can in turn help to amplify conservation efforts, sometimes in unexpected ways. The presenter will share her experience of how volunteering on her son's class field trip eventually led to her whole family's multi-year involvement in a Zoo New England project to help Blanding's turtles, even fostering hatchlings in their guest bedroom. She will describe how she then used her skills as a children's book author to write a novel inspired by that experience, and how she continues to use her platform to help inspire the next generation of environmental stewards. Finally, she will share suggestions for language that can help make volunteers in community conservation projects feel welcome and valued, even when they do not come from scientific backgrounds, and inspire them to continue their conservation commitment even after their project ends.

Presenter Bio: Diana Renn is the author of a new middle grade eco-mystery novel, *Trouble at Turtle Pond* (Fitzroy Books/Regal House), which was inspired by volunteer work she and her son did with Blanding's turtles in Zoo New England's HATCH program. Diana also serves as a Mentor in a program called Creature Conserve, which facilitates creative collaborations among artists, writers, and scientists working on conservation issues. She is the recipient of a 2022 Massachusetts Cultural Council Fellowship Award for creative nonfiction, and is working on a collection of personal essays about community science and neighborhood naturalists. Her essays have appeared

in WBUR's *Cognoscenti*, *Pangyrus*, *Publisher's Weekly*, *The Huffington Post*, *Mindful*, and elsewhere. You can learn more about her at dianarennbooks.com.

Amphibian Species Richness and Distribution in Vernal Pools at Glover's Ledge, Langdon, NH

Kimberly Snyder (*[1] Antioch University New England and New Hampshire Fish and Game Department), Lisabeth Willey [1], Peter Palmiotto [1] & Brett Amy Thelen (Harris Center for Conservation Education)*

Abstract: Vernal pools are important breeding grounds for forest amphibians and vital habitat for many species. With the goal of better managing the Glover's Ledge (GL) property for its amphibian communities, the objectives of this study were to assess the current hydrologic profile of the GL vernal pools over the duration of the breeding season, identify species richness and distribution of amphibians utilizing those vernal pools, and provide baseline amphibian data for future monitoring and management at GL. Egg masses of wood frog (*Lithobates sylvaticus*) and spotted salamander (*Ambystoma maculatum*) in three pools on the site (SWP, LL, and SW) were monitored weekly over 20 weeks from March through August 2020. Hydrological data on pool depth, extent, temperature, and pH were also sampled. All pools contained egg masses for 7 weeks before larvae hatched (except for SW, which dried up prior to larval emergence). The LL pool supported the greatest number of *A. maculatum* egg masses, with a maximum number of 63 egg masses counted. This study is only a single-year snapshot of the GL vernal pool system, so it is too early to draw conclusions about population health or trends from these data alone. However, these baseline data may prove important in beginning to understand the GL amphibian community and reveal areas where we can focus our efforts to improve future studies and management efforts.

Presenter Bio: Kim Snyder is a conservation biologist and environmental educator working in southern New Hampshire. She earned her master's degree in Environmental Studies from Antioch University New England in 2020, and is currently working for NH Fish & Game as a member of the Environmental Review team. She occasionally teaches as an adjunct educator for both the Harris Center for Conservation Education and Antioch University Santa Barbara.

Saving Kestrels One Territory at a Time

William Stollsteimer ([1]Antioch University New England and [2]Harris Center for Conservation Education), Steven Lamonde[1] & Phil Brown[2]*

Abstract: Breeding American Kestrels (*Falco sparverius*) within the United States have suffered a 53% population decline since 1966. In New England, the growing disappearance of kestrels may be linked closely to habitat loss – of both open fields for foraging and nest site availability. The habitat preferences of American Kestrels are well researched, and the installment of appropriately-sized nest boxes in favorable habitat has repeatedly been demonstrated to increase kestrel reproductive success. Despite this knowledge, limited effort had been made to boost kestrel populations in the Monadnock Region until the Harris Center for Conservation Education's pilot kestrel monitoring program in 2022. To assist with this effort, we produced a kestrel habitat suitability model for the Monadnock Region using ArcGIS. Accounting for land cover type, territory size, and proximity to potential threats (e.g., roads), we estimated 34,000 acres of potential kestrel foraging habitat scattered throughout the Monadnock Region, or 4.6% of the total area. Breeding-season American Kestrel records from eBird were used to ground-truth our model and identify over 100 potential breeding sites, of which 25 easily monitorable sites were prioritized for future nest box installation. By objectively identifying optimal American Kestrel breeding sites relative to all potential breeding areas within the Monadnock Region, our model aims to better inform the placement of nest boxes to maximize reproductive success. Moving forward, annual monitoring of nest boxes at these sites will not only improve our predictive modeling process but also, hopefully, document an increasing regional kestrel population.

Presenter Bio: Will Stollsteimer is a passionate birder and a master's student in Environmental Studies at Antioch University New England.