



ANNUAL REVIEW 2021



Great Hollow
Nature Preserve & Ecological Research Center

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Staff

Chad Seewagen, Ph.D.
Executive Director

John Foley
Naturalist & Preserve Steward

Tara Ewers
Education Coordinator

Robert Clark, Ph.D.
Research Scientist

Wales Carter, Ph.D.
Post-doctoral Research Fellow

Board of Directors

Gary Goldring
Chair

Meredith Cleary
Secretary

Eric St. Jean
Treasurer

Chad Seewagen, Ph.D.
Executive Director



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(Cover) Aerial view of
Great Hollow photo-
graphed via drone,
Summer 2021. Above:
Tree swallows



From the Executive Director



I am pleased to introduce this look back at 2021, Great Hollow's sixth year of connecting people with the natural world and the science needed to effectively conserve it for future generations. Following a year of unprecedented challenges and adversity, Great Hollow has grown to be a bigger, better, and stronger organization than ever before. As highlighted in the pages ahead, our dedicated staff worked

through 2021 to not only restore initiatives that had to be scaled down or put on hold the previous year, but to take Great Hollow in bold, new directions. We deepened our commitment to pioneering conservation science and the impact of our research by adding two talented biologists to our staff and almost immediately launching ambitious new studies that integrate our collective expertise in plant ecology, entomology, and ornithology. This year we published novel research on the spatial behavior of wood turtles and the effects of light pollution on bats, which mark Great Hollow's ninth and tenth peer-reviewed contributions to the scientific literature since our young organization's founding. An integral part of Great Hollow's research productivity is our summer internship program, which we were thrilled to bring back and expand after having to

suspend it in 2020. Perhaps no bigger sign of our recovery and growth was the tremendous demand for Eco-Discovery Camp this year. This included nine fully sold-out weekly sessions and higher than ever attendance over the course of the summer. It was so wonderful to once again hear the bustling activity, excited chatter, and laughter of camp children outside my office window as they learned about and explored the great outdoors. The tremendous growth in camp enrollment brought an expansion of our CIT program, which provides unique leadership training to rising high school students interested in environmental and early childhood education. We had an incredible crew this year whose contributions were instrumental in giving our campers a summer they will not soon forget. As always, none of the year's achievements would have been

possible without people like you. You make Great Hollow the special place it is and our resiliency and growth are reflections of your support. For our part, we will never stop trying to provide our local communities with a first-rate resource for environmental education, science, and exploration that you can be proud to call your own. Thank you for being a part of the Great Hollow family and helping make 2021 such a success.

Chad Seewagen

Conservation Science



Above: A radio-tagged wood turtle set for release and tracking. Left: Milkweed caterpillar. Below: Big brown bat, one of two bat species found in our research to be negatively affected by light pollution

Great Hollow’s research program works to provide science that can inform management and policy decisions to safeguard natural resources. This is perhaps no better exemplified than by our work in 2021 which, among other things, included research that can (1) be used to protect bats from sprawling light pollution, (2) protect wood turtles from habitat loss and encroaching development, and (3) guide invasive plant management priorities. Each of our research efforts this year has involved important contributions from partners in academia, government, and conservation NGOs, and yielded results that can be put directly into conservation action.

As featured in last year’s Annual Review (“Conservation Science,” pp. 4-7), Great Hollow has been working since 2016 on one of the first quantitative studies of the effects of light pollution on North American bats. We completed the study this year and concluded that light pollution causes significant displacement of little brown bats and big brown bats from their foraging habitat while having neutral or mixed effects on three other species. This causes a significant shift in bat community composition in the presence of light, thereby disrupting natural competitive balance among species. The species we found to exhibit the strongest aversion to light, the little brown bat, is also the one of greatest conservation concern. Our results suggest the little brown bat is likely to experience restrict-

ed foraging habitat availability and competitive disadvantages against other bats in light-polluted environments, which raises additional concern about the conservation of this already-endangered species as light pollution continues to spread and intensify across its geographic range. We were proud to have the study published earlier this year in the peer-reviewed journal, *Ecology and Evolution*, and expect it to be an important resource for agency biologists and regulators responsible for the protection of bats. As a follow-up to this research and with a grant from the Connecticut Department of Energy & Environmental Protection, Great Hollow is now designing an experiment for 2022 that will investigate the distances up to which artificial light at night displaces bats. Is it five meters from the source? Ten meters? One hundred meters? This distance threshold has profound implications for the cumulative footprint of disturbance to bats caused by light pollution. Our new study will help pinpoint the size of the effect zone surrounding lights and allow natural resources managers to better understand the impacts of light pollution to bats on a landscape scale.

Last year’s Annual Review also featured a story about our research on the movement patterns and home range sizes of the imperiled wood turtle. After five years of radio-tracking 31 different turtles, a whole lot of statistical analyses and writing, and a lengthy peer review process, we were pleased to have the study published this year in the journal *Chelonian Conservation and Biology*.

Our study is the first to describe the area requirements, home range fidelity, hibernaculum fidelity, and upland movement distances of wood turtles in the western Connecticut and eastern New York portion of their geographic range. We expect this information to greatly inform efforts to buffer wood turtle streams from encroaching development and ensure the turtles’ area requirements are maintained. Our results indicate that habitat protection efforts for wood turtles in western Connecticut and eastern New York should consider that an individual turtle utilizes an average area of 13 acres annually to meet its resource requirements and, on average, will range as far as 380 feet away from its home stream into surrounding upland forest. Even though the wood turtle is a protected species in both Connecticut and New York, these states do not currently afford wood turtle habitat any standalone regulatory protection and impose buffers of only 100 feet around streams to protect water quality. Our results indicate that these stream buffers are inadequate to maintain sufficient upland habitat for wood turtles and that regulatory protection of wood turtle habitat should be considered by these states to help sustain their wood turtle populations.

With the addition of two new scientists to Great Hollow this year, we didn’t waste any time combining our collective expertise in food web ecology, nutritional ecology, ornithology and entomology to also launch an ambitious, first of its kind study on the effects of some of

the Northeast’s most invasive plants on insect community composition, trophic interactions between insects and birds, and the nutritional quality of insects as food for birds. As featured in the pages ahead (pp. 10-13), this study involved an exhausting amount of field and lab work to cat-



Photo © Liam McGuire



atalogue thousands of insects living on 240 trees and shrubs of 10 different species across Great Hollow’s preserve, half of which we covered in netting to exclude birds and serve as “controls.” Contrasting insect community composition and biomass between the control trees and the trees birds were able to access allowed us to identify the insect groups preyed upon most by birds, how those prey preferences of birds compare among plant species, and how intensively birds feed on insects from native vs. non-native plants. The results of this project will provide some of the first information on how invasive plants in our region, like burning bush and honeysuckle, stack up against native trees and shrubs in their quality as insect hosts and food sources for woodland songbirds. This knowledge can then be used to guide invasive plant management priorities towards the species that have the most negative impacts to insect and bird communities, and away from those that provide similar value as native plants.

Another new study launched this year, led by Great Hollow’s post-doctoral research fellow Wales Carter, is looking at the timing of diet switches from summer in-

sect-based diets to autumn fruit-based diets in migratory songbirds, the antioxidant content of those diets, and the implications of both for the birds’ energetic condition as they migrate from northern North America all the way to the Neotropics. Assessing these patterns will improve scientists’ current understanding of the interactions between plant communities and songbirds during migration, including the threat posed by non-native plants, whose berries tend to have significantly lower antioxidant content than those of native plants. The project is analyzing bird diets along a latitudinal gradient of stopover sites using stable isotope analysis of feather and blood samples, and histological analysis of fecal samples. The samples were collected from birds by our partners at the Braddock Bay Bird Observatory in Rochester, NY, the Hogback Mountain Banding Station in Marlboro, VT, and the Powdermill Avian Research Center in Rector, PA, as well as right at Great Hollow. Field work for the project in the fall was a great success, with samples obtained from more than 150 individuals of our two study species (Swainson’s thrush and hermit thrush) across the four study sites. The samples will

be analyzed in 2022, with results expected by the end of the year.

Over the past year, we also made substantial progress with our research on how the effects of Japanese barberry on insect community composition, in turn, affect the diet composition of songbirds, and the effects of mercury pollution on the energy metabolism of migrating birds. We expect both studies to be completed and published in 2022. We certainly can’t do all of this alone and are proud to acknowledge our institutional collaborators who made significant contributions to our research this year. They include the American Museum of Natural History, Braddock Bay Bird Observatory, Carnegie Museum of Natural History/Powdermill Avian Research Center, Columbia University, Rochester Institute of Technology, Texas A&M University, University of Massachusetts - Amherst, University of New Hampshire, and University of Western Ontario. There is much more yet to come, and we look forward to working on current and new projects with our research partners in another busy year ahead.

Current Projects



Effects of invasive plants on insect-bird trophic interactions and the nutritional quality of insects as food for birds in North-eastern forests.



Forest songbird diet composition in an arthropod food web altered by invasive Japanese barberry



Impacts of forest disturbance on spring wildflowers and their seed-dispersing ant mutualists



The scale and timing of antioxidant-rich fruit consumption by long- and short-distance migrant songbirds along a latitudinal gradient, and the implications for body condition



Distance thresholds of LED lighting effects on bat activity, presence, and species composition



Metabolic effects of mercury exposure in migrating songbirds: implications for migratory performance



New England cottontail population estimation and monitoring at Great Hollow Nature Preserve

Meet Our New Scientists

This year we were excited to welcome two new biologists to the Great Hollow team – research scientist Dr. Robert Clark and post-doctoral research fellow Dr. Wales Carter. Dr. Clark is an entomologist and data scientist who studies the roles of insects in forest and agricultural food webs, and uses advanced modeling techniques to develop management strategies for invasive insects. He joins us from Washington State University where he was an assistant research professor for a year, and before that, was a post-doctoral research fellow. His research at WSU focused on invasive insect outbreaks affecting legume crops in the Pacific Northwest. Originally from Connecticut, Dr. Clark is happy to be back home in the New England woods that captured his imagination as a child and inspired him to become an ecologist. He attended Central Connecticut State University, where he earned a B.S. and M.S. in Ecology and Environmental Science, and then earned a Ph.D. in Biology from Wesleyan University for his research on the beneficial role of ants as “keystone species” in Connecticut forests. His work has been published in several prominent journals, including Ecology, Ecology Letters, and Oecologia, and he is an associate editor of the journal Food Webs. At Great Hollow, Dr. Clark is current-

ly studying the effects of non-native plants on insect-bird trophic interactions, and the effects of forest disturbance on the mutualistic relationship between spring ephemeral wildflowers and the ants on which they depend to disperse their seeds. He also maintains an adjunct faculty affiliation with WSU and continues to collaborate with colleagues there on USDA-funded research in the Pacific Northwest, and provides data analysis services as a consultant to the agriculture industry.

Dr. Wales Carter is a physiological ecologist who studies interactions among animal nutrition, physiology, and behavior, particularly in the context of bird migration. He earned his B.A. in Biology from Dartmouth College and a Ph.D. in Biological and Environmental Science from the University of Rhode Island, studying the effects of dietary fatty acids and antioxidants on the energy metabolism of migrating songbirds. Prior to joining Great Hollow, he completed a post-doctoral fellowship at the University of Rhode Island where he studied the diet and spatial behavior of the imperiled New England cottontail rabbit. His research has been published in several leading journals, such as Ecology and Evolution, Physiological and Biochemical Zoology, and the Journal of Experimental Bi-

ology. At Great Hollow, Dr. Carter is leading a study of the scale and timing of antioxidant-rich fruit consumption by long- and short-distance migrant songbirds during fall migration, and its implications for their energetic condition. The study is using isotope analyses of feather and blood samples collected from birds in northern New York, southern Vermont, western Connecticut, and western Pennsylvania to also investigate changes in diet along a latitudinal gradient, as birds make their way from north to south. Dr. Carter is also working with Great Hollow’s executive director Dr. Chad Seewagen on an ongoing study of the effects of non-native Japanese barberry on the diet composition of forest-breeding songbirds.



Dr. Robert Clark

Entomologist &
Data Scientist



Dr. Wales Carter

Physiological
Ecologist



Are invasive plants really that bad?
It depends.

By Rob Clark

Humans have done a particularly good job introducing exotic plants to North America ever since European colonization. Agriculture, global trade and travel, and the landscaping industry have brought hundreds of non-native plant species here from other continents over the past two centuries. Many

of these plants are now well-established parts of the landscape, and thorny problems for land managers and conservation biologists. These days it is hard to find a forest that is not under attack by noxious, invasive weeds like Japanese barberry, autumn olive, and burning bush. Because these species did not previously occur in North America, scientists are concerned about the ability of native biodiversity to cope with this major and rapid environmental change. Are pollinators able to get enough nectar and pollen from the flowers of non-native plants? Are birds able to meet their nutrient requirements by eating the fruits and insects found on these plants? Are the exotic invaders displacing rare and endangered plants?

By combining our in-house expertise in plant ecology, entomology, and ornithology, Great Hollow is investigating some of these very important questions facing the conservation community today. At the center of this work is a new study conducted this year by Drs. Robert Clark, Wales Carter, and Chad Seewagen of Great Hollow, and collaborator, Dr. Susan Pagano of the Rochester Institute of Technology (it takes a village sometimes). We examined how many beneficial, native insects are supported by some of the most common and vilified invasive trees and shrubs (Japanese barberry, autumn olive, honeysuckle, and burning bush). We compared this to native plant species in the same forest, including musclemwood, striped maple, witch-hazel, black birch, shadbush, and American beech. Using a predator exclusion experiment that in-



involved covering tree branches with bird-proof netting, we also compared the extent to which songbirds feed on insects from native versus non-native plants, and what insect groups they prey upon the most.

The field work for this project was a monumental effort, to say the least. Our team collected and identified 17,165 invertebrates (yes, seventeen thousand beetles, ants, caterpillars, spiders, and so on). We collected these invertebrates from a total of 154,595 leaves across 240 native and non-native trees and shrubs. Most of this tiresome and tedious work was done by Great Hollow’s amazing research interns Joan Tremblay, Max Kirsch, and Chris Tait, and volunteers Joe McGlaughlin, Ethan Mackenzie, and Alexa Dattner, who spent countless hours this summer collecting and identifying insects.

Although they are preliminary, our results so far do not entirely demonize invasive plants as one might expect. Caterpillars, which are a critical food source for songbirds during the summer nesting season, are indeed about half as abundant on the non-native invasive plants as they are on the natives. However, some other arthropod

groups, like spiders, are just as common on invasives, and in some cases, even more abundant. Spiders are another important component of most songbirds’ diets, and the birds seem to have picked up on the abundance of spiders and other tasty arthropods that can be found on the invasive plants. Our predator exclusion experiment showed bird foraging intensity

to be just as high on the non-native, invasive plants as on the native plants (see Figure 2 on p. 13).

When we also look at the combined biomass of all of the insects on a plant, one invasive species – Japanese honeysuckle – has just as much insect prey available to birds as our top-ranking native plant – musclemwood. Although the rest of the invasives (Japanese barberry, autumn olive, and burning bush) are ranked in the bottom half, they are joined there by two natives – American beech and striped maple. So, we observed no clear separation between native and non-native plants in the biomass of insect prey they provide for songbirds.

What are the takeaways from a habitat management standpoint? Well, one pattern that has emerged from

Above: Great Hollow’s field crew collecting insects from native and non-native plants using a “beat sheet” technique in which a plant is struck with a stick to dislodge insects from the foliage onto a white sheet below, from which they are easily transferred to labeled collection vials.

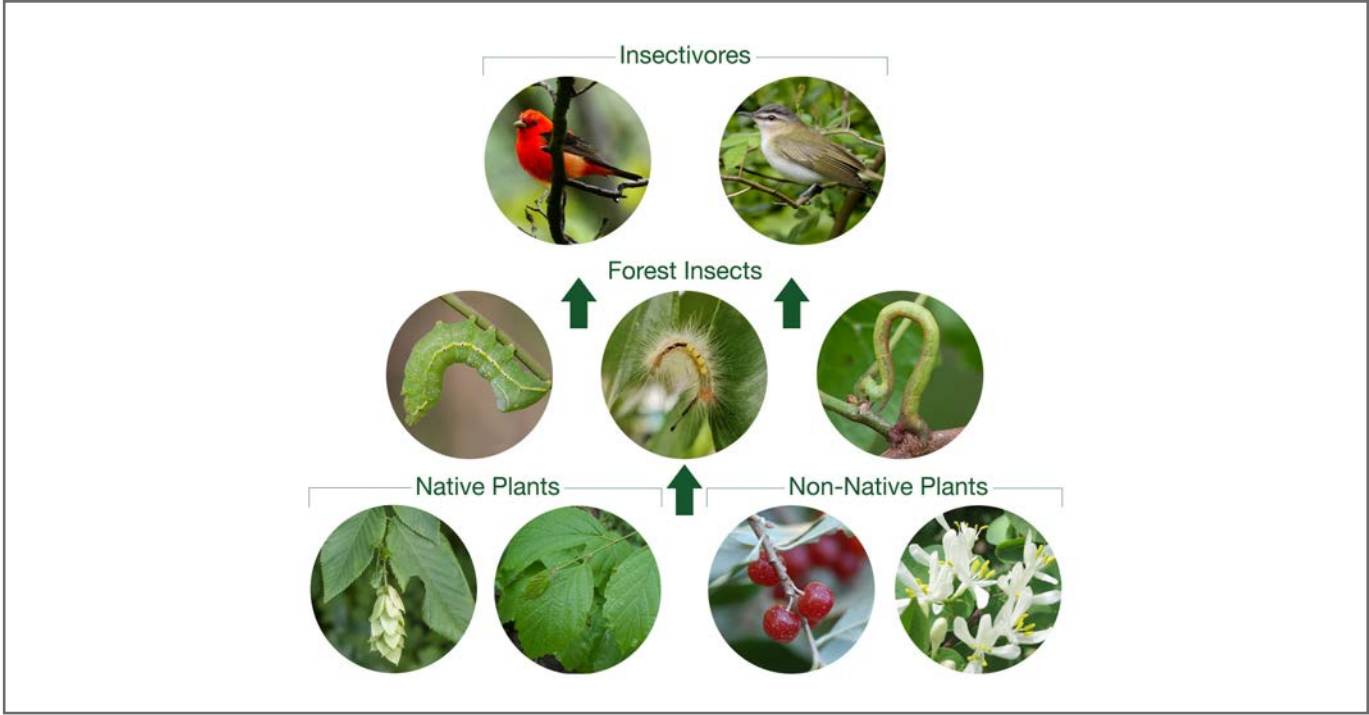


Figure 1. Trophic interactions being studied in the forest food web at Great Hollow. How do invasive plants affect the species, abundance, and nutritional quality of insects available to birds as food?



Red-eyed vireo (left) and yellow-rumped warbler (above), two common insectivorous birds of Great Hollow.

our work so far is that some invasive plants are not as bad as others, and some even support similar insect communities as native plants. This is important because removal of invasive plants on a large scale is extremely time-consuming and labor-intensive, and therefore costly. Conservation funding is always limited, so it needs to be directed where it will have the greatest impact. In this case, our preliminary findings suggest it would be most effective for land managers to focus resources on the control of poor insect

hosts like burning bush over higher quality hosts like Japanese honeysuckle. These findings are only the beginning, as there are many more analyses to be conducted on the massive dataset collected for this study. The next step of this research will be to compare the nutrient composition of insects on native and non-native host plants. This will not only tell us how non-native plants affect the *quantity* of insects available to birds, but also the *quality* of those insects as food. Stay tuned for more results to come!

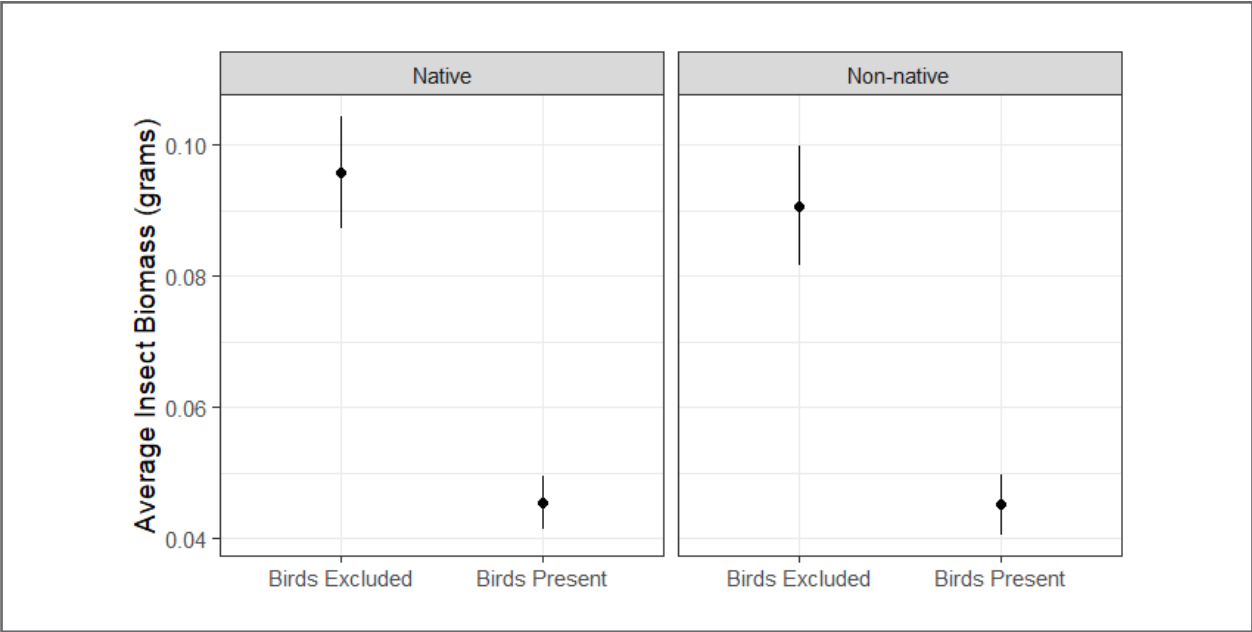


Figure 2. Insect biomass on native and non-native trees that were exposed to birds or protected from birds by exclusion netting. Similar effects of the exclusion netting on native and non-native plants indicates that birds forage just as intensively on the non-native plants as they do on the natives.



Photo ©: Amanda Cheeseman

Tracking the Elusive New England Cottontail

By Wales Carter

From Peter Rabbit to Bugs Bunny and Water-ship Down, rabbits have maintained a stable place in our modern culture and collective imagination, yet it can be all too easy to miss the real rabbits amongst us in our day to day lives. This is particularly the case for the New England cottontail, one of only two rabbit species native to Connecticut, and the only one likely to have ever occurred throughout much of the state (Connecticut sits at the very southern edge of the range of the other, the snowshoe hare). As a reclusive animal that favors dense, shrubby habitat that is nearly impenetrable for humans and provides excellent camouflage for the plain brown rabbits, the New England cottontail certainly isn't hard to miss. Moreover, not only is the New England cottontail dif-

ficult to find in the best of conditions, but it has also been experiencing severe population declines over the past 60 years that have led to extreme rarity or complete extirpation throughout much of its geographic range.

Several hypotheses have been proposed to explain these declines. For one, the landscape of the Northeast has changed considerably over the last half-century, with many fields, shrublands, and farmlands that once provided habitat for New England cottontails maturing into forest or being lost to development. At the same time, the region has also seen the spread of the closely-related eastern cottontail following its introduction in the early 1900s from its native range west of the Hudson River. The eastern cottontail may contribute to New England cottontail declines through direct competition for resources, through hybridization, or simply by colonizing newly created patches of habitat faster. These days, you are much more likely to see an eastern cottontail than a New England cottontail, both because of their larger, more widespread population and because they are more willing to inhabit open areas with little cover. When you see a rabbit in your backyard, for ex-

ample, it is almost certainly an eastern cottontail.

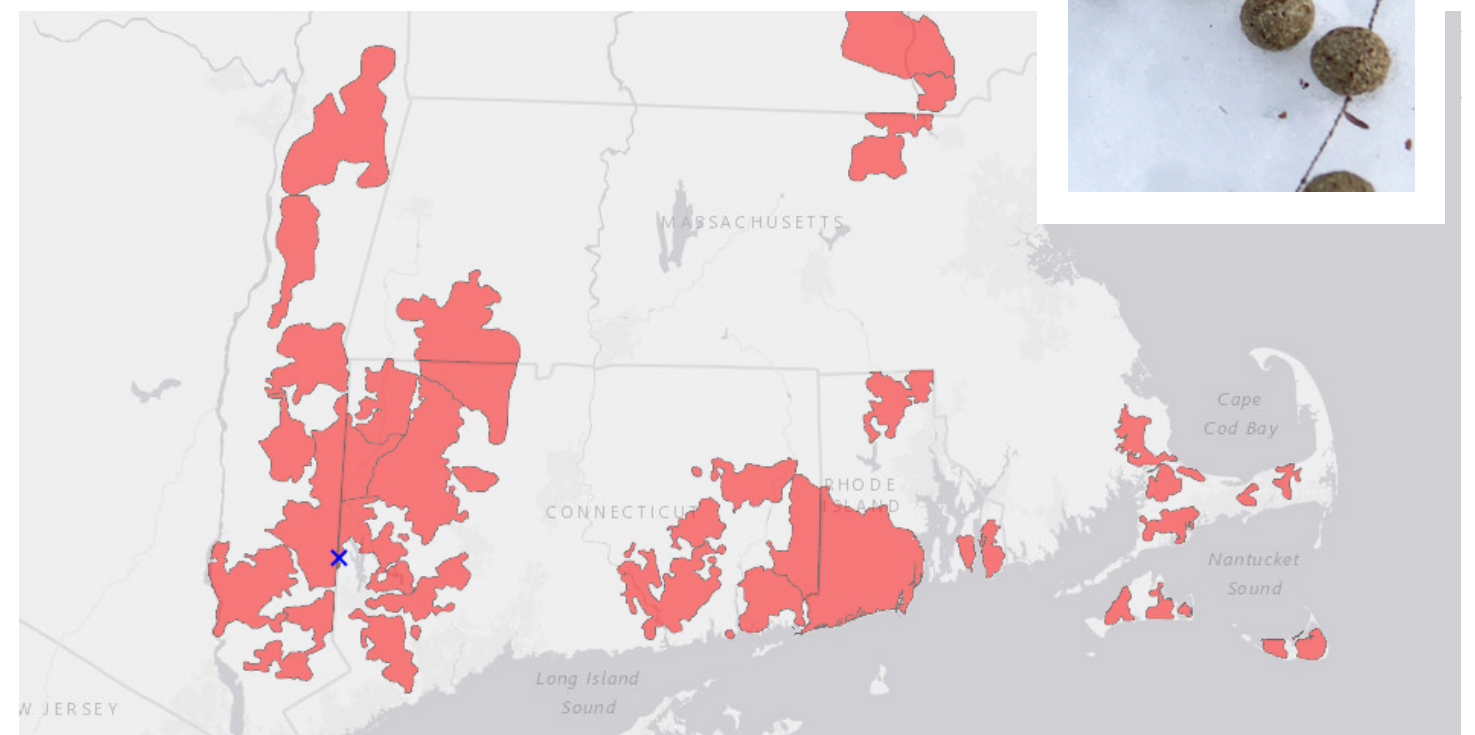
In response to the precipitous decline of the New England cottontail, the last 15 years have seen a coordinated regional effort involving federal and state agencies, universities, and non-profit conservation organizations to save the species from extinction. Naturally, the first step towards such efforts is to identify the locations, sizes, and trends of local populations. Towards that end, Great Hollow has been working with the Connecticut Department of Energy and Environmental Protection (DEEP), the University of Rhode Island, and the University of New Hampshire to survey and assess the population size of New England cottontails at our preserve. How do you go about finding a bunny that doesn't want to be found? Mainly by looking for signs that can't hop away—fecal pellets. Starting in the winter of 2017 and continuing each winter through the present, Great Hollow's naturalist John Foley and DEEP staff have conducted standardized transect surveys for cottontail pellets, focusing primarily on areas with young forest and dense understory along the eastern side of the Quaker Brook valley. Timing surveys in the winter after a fresh snowfall greatly increases the chances of finding brown rabbit pellets against a white background while also helping to preserve the samples. Over this period, the team has managed to collect more than 120 pellet samples.

With pellets in hand, the first step is to determine the species of rabbit from which they came. This is done by our partners at the University of Rhode Island's Wildlife

Genetics and Ecology Lab by extracting DNA from the pellets and evaluating the code at a series of short segments called microsatellites. Based on this analysis, we have been able to confirm the presence of both New England cottontails and eastern cottontails at five distinct sites within Great Hollow, with the New England cottontail surprisingly representing the vast majority of pellets collected from all but one of those sites. Interestingly, while four of the sites are old fields maturing into early successional forest (where you would expect to find New England cottontails), the fifth site is within an area of mature forest with a dense understory. This finding is consistent with recent research from nearby areas in New York that has found, contrary to prior knowledge of the species' habitat associations, New England cottontails commonly use mature forest, provided the understory is sufficiently dense. It is possible this movement from early successional habitats into surrounding areas of mature forest is a behavioral response of New England cottontails to escape competition from eastern cottontails. Their willingness to inhabit mature forest means there may be much more habitat available to New England cottontails in the region than previously thought since mature forest is far more abundant across the landscape than early successional habitats. It also suggests that mature forest might not always be a major barrier to dispersal by New England cottontails, which alleviates some concerns about insufficient gene flow among isolated patches of early successional habitat.

Beyond using fecal pellet DNA to identify the species, full genotyping can be used to tell individual

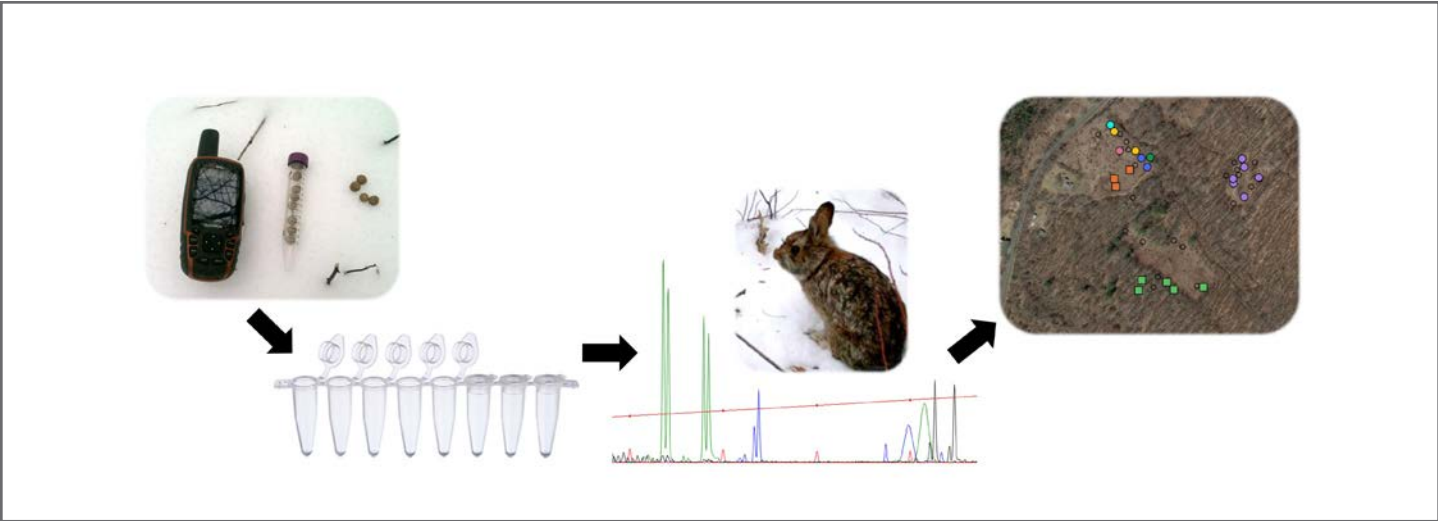
Geographic range of the New England cottontail (X marks Great Hollow). Inset: Rabbit pellets on a fresh snowfall, ready to be collected for species and individual ID.



New England Cottontails



Photo ©: Amanda Cheeseman



Above: Work flow for surveying New England cottontails at Great Hollow. Transect surveys are conducted following a fresh snowfall to search for rabbit pellets. Pellets are collected and GPS coordinates of their location are recorded. In the lab, DNA is extracted from the pellets and sequenced to identify the species as New England or eastern cottontail, and the number of unique individuals represented. Locations are then mapped to show the abundance and distribution of each species at Great Hollow. Below: University of New Hampshire graduate student, Melissa Bauer, genotyping rabbit pellets collected at Great Hollow.

rabbits from one another and thus produce an estimate of population size. Working with University of New Hampshire doctoral student, Melissa Bauer, we have so far successfully genotyped six pellet samples collected in 2018 and thirty-four pellet samples collected in 2019, and found 15 unique New England cottontails to be represented among them. While this may not seem like a large number, it translates to an average density of 0.7 New England cottontails per acre in the sites at Great Hollow, which is more than double the statewide average density of 0.3 rabbits per acre in Connecticut over the same time period. It is also substantially greater than the statewide averages of 0.1 rabbits per acre in New Hampshire and 0.2 rabbits per acre in Maine. Although preliminary and based on a small sample size of data, this suggests that Great Hollow may support a New England cottontail population of statewide significance. The population at Great Hollow may also be relatively healthy and stable based on our findings of a nearly even mix of male and female rabbits among the pellets, and at least one individual surviving long enough to be detected in both years.

Where do we go from here? As with any rare and declining species, continual monitoring of the population is important for detecting and heading off any developing threats. Great Hollow plans to continue working with DEEP and UNH to collect and genotype pellets from our preserve to keep tabs on any future changes in distribution and abundance. Beyond that basic step, we also have an opportunity to manage parts of Great Hollow to create conditions that further benefit New England cottontails while disfavoring their non-native competitor, the eastern cottontail. With funding and technical guidance from the USDA Natural Resources Conservation Service (one of

many agencies working with private landowners to help reverse New England cottontail population declines), we are developing a management plan to enlarge the patches of habitat currently occupied by New England cottontails at Great Hollow and encourage growth of the dense, native, woody vegetation they require most. Great Hollow is also an active participant in the New England Cottontail Technical Committee, a multi-state consortium of agencies and organizations, to stay informed of the best available science regarding New England cottontail management and conservation. As always with wildlife management and research, we have a good start, but there is much left to do!



Seasonal Research Staff

Our summer internship program provides aspiring biologists with hands-on field and lab experience working alongside Great Hollow's scientists on a variety of studies. These seasonal staff members play a critical role in our research and much of what we do would not be possible without them. Usually college students or recent graduates who are pursuing careers in conservation, our interns work tirelessly and often in inclement, challenging conditions to help collect the data needed to answer our current research questions. In 2021, we were pleased to welcome three outstanding conservation biologists in the making, Max Kirsch, Joan Tremblay, and Chris Tait. At the time, Max was a recent graduate of Cornell University, interested in bird

and insect taxonomy and systematics, and Joan had just completed her junior year at UConn, majoring in Ecology and Evolutionary Biology. Chris, in contrast, was a working professional looking to develop and expand his career as a high school science teacher. Each had previous experience working with local insects and/or birds, and were brought on to help with our research on the effects of invasive plants on insect community composition and trophic interactions between insects and birds. From May through July, Max, Joan, and Chris spent hundreds of hours in the field and the lab collecting and identifying more than 17,000 insects from 240 trees across our preserve. We could not have been more impressed by the work ethic, dedication, and endurance they each demonstrated towards this tedious and exhausting effort. Most importantly, Max, Joan, and Chris gained valuable experience to help advance their careers while also having loads of fun being part of the Great Hollow team. "My time at Great Hollow allowed me to develop important technical skills while also gaining an inside look at how a non-profit organization dedicated to conservation and research functions. It was such an enjoyable experience!" said Joan after wrapping up her internship and heading into her senior year of college. Max is currently back home in Indiana and applying to master's degree programs for the fall of 2022. Chris is teaching at Ridgefield High School, where he is the chair of the science department and simultaneously pursuing a Ph.D. in Biological Sciences at Fordham University. We are certain they all have bright futures in the fields of environmental research and conservation ahead of them, and wish them great success!

Left to right: Max Kirsch, Joan Tremblay, and Chris Tait



Meet Our New Education Coordinator

In August, we were pleased to promote Tara Ewers to be Great Hollow's new education coordinator and the director of our Eco-Discovery Camp. Tara's predecessor Maggie Cozens moved on to be the associate director of environmental studies at a boarding school in the Hartford area at the end of the summer and we wish her the best in her new endeavor. Tara steps into the role of education coordinator and camp director after a year of working alongside Maggie as a program assistant, so she is already a familiar face to many of the kids and parents who frequent Great Hollow. Tara has wasted no time putting her spin on Great Hollow's programming, especially using her art background to emphasize the "A" in STEAM (Science, Technology, Engineering, Art, and Math). Tara has a B.A. in Art from Western Connecticut State University and a Certificate in Photojournalism and Documentary Photography from the International Center of Photography in New York City. Prior to joining Great Hollow, she taught photography at Western Connecticut State University and was the

director of the Bank Street Theater in New Milford. Tara is currently taking courses towards a master's degree in environmental conservation and plans to study bats at Great Hollow this summer for her thesis research.



Eco-Discovery Camp

Great Hollow strives to provide a summer camp experience like no other in our area. Our science-based day camp allows kids to spend their days outdoors, forging connections with nature and exploring the diversity of life on our 825-acre preserve. Each weekly session revolves around a theme designed to foster a child's innate curiosity for the natural world around them. Using an interdisciplinary and experiential approach, our campers learn about myriad subjects that range from watershed science and wildlife ecology to agriculture, orienteering, and wilderness survival.

After a greatly scaled back format in 2020 due to COVID-19, Eco-Discovery Camp returned in full force in 2021 with our largest enrollment ever. With registration filled to capacity for all nine sessions and more than 100 different children attending camp over the course of the season, it was great to see so many kids able to once again enjoy what summer should be all about, and what Great Hollow has to offer. Campers catching crayfish in Quaker Brook, examining insects under magnifying glasses, making their own fresh snacks from the vegetable garden, and free-playing with friends were some of the scenes of summer at Great Hollow that we were so happy to have back. We were touched to have one parent say "Thank you for all you do and have done for our children. Great Hollow is such a special place, where memories are made. We are so grateful to have you."

Our curriculum this summer debuted some new themes that turned out to be very popular and might have to be a mainstay from now on. During our Dig This session, campers learned about geology, archeology, and anthropology as we explored the history of Connecticut from the ice age to the present. The week included one very special morning when we were visited by Darlene Kascak from the Institute for American Indian Studies. Ms. Kascak is a member of the Schaghticoke Tribal Nation and a tradition-

al Native American storyteller. Campers got to hear three traditional stories, try out some Native American tools and instruments, and learn how the indigenous people of our area lived in harmony with nature in the land they called Quinnehtukqut.

Also new to camp this year was the addition of our Eco-Discovery Garden as a hands-on tool with which to educate campers about agriculture, sustainability, soil science, the plant life cycle, and pollination. Campers helped grow (and eat!) a variety of herbs, fruits, and vegetables, including tomatoes, carrots, cucumbers, squash, corn, peppers, basil, mint, and parsley, just to name a few. They were able to get their hands dirty planting seeds, water

the plants, observe pollinators in action, and ultimately harvest their crops. During our Roots and Shoots session focused on plants and agriculture, campers made refrigerator pickles and garden-fresh salsa using only items grown themselves in the garden. One camper's grandmother had to tell us how amazed she was to see her granddaughter, who allegedly hates tomatoes, make her own fresh tomato salsa and not only try it, but love it!

This year's summer camp also saw art further integrated into our programming as a way to reinforce scientific concepts and help kids retain information. During STEAM week (Science, Technology, Engineering, Arts, and Math), campers learned about geometry and patterns

used in a traditional Japanese method of dyeing fabric called shibori. Campers were each given a t-shirt to fold and bind using popsicle sticks, cardboard, and rubber bands. The next day campers were delighted when each of their geometric designs was unveiled during our morning meetup. In addition to the shibori project, campers also created their own wetland dioramas and plastic pollution art during our water weeks, made recycled paper during STEAM week, weaved paper baskets and made felted soap during our Dig This week, and much more.

We already can't wait for next summer and hope to have many new kids find out what the Eco-Discovery Camp experience is all about!



Photo ©: Tara Ewers

Community Engagement

Great Hollow's community events are intended to provide families with a variety of fun and educational experiences you won't find anywhere else in our area. After having to severely limit the number, size, and types of programs we could hold during the height of the pandemic last year, we were thrilled to offer more than 25 in-person events in 2021

An evening of socially distanced live music on the lawn



that were enjoyed by more than 1,000 total people. These events included the return of annual favorites, like Hollow Fest, along with new additions, like an outdoor concert series that is sure to become a summer standard. We kicked off the summer with a free cookout and reptile show to thank everyone for their unwavering support over the prior year and celebrate a return to normalcy. It was great to see so many familiar faces gathered at Great Hollow again. Themes of other events ranged widely from ever-popular guided hikes to maple syrup-making demos, winter bird counts, natural history poetry readings, and walk-and-talk programs about vernal pools, bird migration, pollinators, and more. Whatever your interests, we're sure to have something for you!

There was fantastic turnout and beautiful weather for the concert series, which featured Dylan Doyle, Echoes of Sinatra, and the BnB Jazz Trio. Nearly 300 people came to enjoy the live music under the stars while also raising almost \$3,000 to support Great Hollow's mission. We are so grateful to Billy Flash of Edward Jones Investments for helping to organize and sponsor the shows, along with generous additional sponsorships from Luks Realty and Patterson Auto Body. We look forward to making this a tra-



2021 art show winners for photography ("Forced Perspective" by Jodie Anne Schopfer) and painting/drawing ("Eastern Bluebird" by Christina Maschke)

dition with many more outdoor music nights in 2022 and beyond.

Several of our events this year celebrated the important connections between nature and the arts. From plein air painting days to floral design and wreath-making workshops, myriad DIY & Wine crafting nights, and a wild-flower macrophotography workshop led by acclaimed nature photographer Ellen Woods, art continued to have a strong presence in our programming. We also held our fourth annual Juried Painting and Photography Show with great success. Bigger than any previous year by far, this year's show featured more than 150 amazing paintings, drawings, and photographs by more than 50 talented artists from 26 different towns across Connecticut and New York. Great Hollow volunteer and show coordinator Linda Hubbard continues to amaze us with her ability to put together a bigger and better show year after year. We thank Linda and her fellow organizers John O'Donnell, Christy Bonaiuto, Carolyn Cohen, Jeff Ginsburg, Justin Goodhart,

Mary Jane Magoon, Annie McAward, Masumi O'Donnell, and Neil Zobler for their outstanding efforts. We also thank the jurors, John Clery and Michael Garland, for their keen eye and choice of well-deserving winners, and all of the local businesses that sponsored the show by generously donating prizes for the winning artists (see Acknowledgements, p. 25). Congratulations to first-place winners Christina Maschke for her photograph "Forced Perspective" and Annie McAward for her drawing "Eastern Bluebird."

Thank you to all who participated in our 2021 community events; we look forward to seeing you for more fun in the year ahead!



Eco-Discovery Garden

Photo ©: Tara Ewers

A new addition to Great Hollow this year is our Eco-Discovery Garden – a demonstration garden for children where they can learn about agriculture, sustainability, the plant life cycle, and pollination, and engage their senses by feeling the soil, smelling the veggies, and tasting the herbs. The garden consists of nine raised beds, making it easier for children to plant, care for, and observe crops as they grow. This year, with the help of our summer campers, we grew five varieties of tomatoes, three varieties of eggplant, four varieties of peppers, three varieties of squash, spring onions, ornamental corn, potatoes, kale, arugula, green beans, cucumbers, garlic, carrots, parsnips, and a variety of herbs.

Campers made refrigerator pickles, salsa, and other snacks with the veggies they grew, and usually couldn't walk past the garden without snapping something off to eat right then and there. The garden is adjacent to our pollinator garden, across from the Merritt House, and open for visitors to check out, so be sure to pay a visit! Whenever our campers haven't already eaten everything, there will be a table of fresh veggies next to the visitor parking area for you to enjoy. Feel free to help yourself! Installation of the Eco-Discovery Garden was made possible by a grant from the Connecticut Society for Women Environmental Professionals and generous donations of materials by Ring's End in New Milford and Halas Farm Market in Danbury.

Generous donations were made in 2021 by Admiral Real Estate Services, Jason Blum, Julie Burnett-Toscano, the Churner Leonetti family, Natasha Daniels-Pearson, Jaime Garamella, the Goldring Family Foundation, Friends of the Great Swamp, Jonathan Gordon, David Gropper, Khris Hall, Roberta Hrdy, Brian Kiely, Jeffrey Kilberg, Catherine Kelly in loving memory of Roberta Marsh, the Ada Howe Kent Foundation, the McIntosh/Toobin Charitable Foundation, New Fairfield Community Thrift Shop, Amy Plante in recognition of Logan Kocot's dedication to Scouts and service, the David & Nancy Riggs Charitable Fund, The Song, Stephen Woods, Eric Welsh, and several anonymous donors. Andrew Hopkins kindly "adopted" one of Great Hollow's non-releasable screech owls to help support the bird's care.

Art show prizes were donated by Visual Impact, New Milford Swim & Tennis Club, Barn Gallery & Frame Shop, Bank Street Theater, Sherman IGA, Sherman Wine & Spirits, Land Gallery, Sarah's Gift n' Ship, American Pie, Biscotti's, The Cue, Fairwood Wine & Liquors, One Stop Cleaners, Painted Lemon, Sacred Grounds Coffee, and Scotty's Putnam Lake Wines & Liquors. The Music on the Lawn series was generously sponsored by Edward Jones Investments, Patterson Auto Body, and Luks Realty. Goat Boy Soaps of New Milford kindly donated soap for an Eco-Discovery Camp crafting project.

Friends of Great Hollow who volunteered their valuable time to help with events, stewardship, research, and raptor care include Riley Anderson, Jennifer Andrews, Lynne Bernstein, George Buck, Shane Consentino, Alexa Dattner, Bill Flash, Jeff Ginsberg, Justin Goodhart, Claudia Henry, Linda Hubbard, Chris Keenan, Elizabeth Kiritharan, Lu Li, John Lindner, Mac Mackenzie, Joe McGlaughlin, Dan Meyer, John and Masumi O'Donnell, Tom Philbrick, Ronald



Reid, Patrick Reilly, Chris Tait, Kevin Van Vlak, Tyler Whitcomb, Ellen Woods, and Neil Zobler. We also extend our thanks to Dr. David Gropper for serving as our camp physician for the 5th straight year.

We were honored to receive a grant from the CT Society for Women Environmental Professionals to support the installation of our new vegetable garden. Additional materials for the garden were generously donated by Ring's End and Halas Farm Market. We were also thankful to receive an antique tractor from Richard Connell for use and display at Great Hollow.

We thank Scout Troop 137 for the great service projects they completed this year. For his Eagle Project, Daniel Seiler built a new information kiosk by the visitor parking area, Dellaney Flower installed a sun compass for her Eagle Project, and Brennan Hearty manned the information table at Hollow Fest. We thank all of them for their quality work!

Finally, we thank our members for their ongoing support and commitment to keeping Great Hollow going strong.

2021 MEMBERS

Merritt Club	Gary Goldring Henry and Sabine Renard Amy McIntosh and Jeffrey Toobin
Quaker Brook Club	Donald and Cindy Tanenbaum
Sponsor	Justin Mondshine
Family	Andrea Barry Barbara Berliner Fleur Fairman Katie Firth Luciana Fota Jaime Garamella Jennifer Gray David Gropper Linda Hubbard Cathy Kadets Victoria Landry Kristina Leonetti Amy Lokhin Erin Lynch Dawn Maguire Amy McIntosh Steven Pitt Brett Pranksy Anita Raja Michelle Ravich Stephen Schneider Kenneth Smalley Joanna Wozniak Brown
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**Great Hollow Nature Preserve
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225 Route 37 | New Fairfield | CT
(203) 546-7789
GreatHollow.org
info@GreatHollow.org**