

Fall 2026

Field Notes

Vermont Center for Ecostudies | Uniting People and Science for Conservation

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Field Notes

Fall 2026

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Yellow-rumped Warbler
(*Setophaga coronata*)

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The Vermont Center for Ecostudies (VCE) is a nonprofit organization whose mission is to advance the conservation of biodiversity across the Americas through research, monitoring, and community engagement.

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VCE View

Pieces, Patterns, and Processes

My fellow graduates of UVM's field naturalist master's program will recognize the title of this piece as its signature approach to the study of nature.

When reading the landscape, we first notice the *pieces*. It's almost like getting to know our neighbors. Sugar Maple. Ovenbird. Red-backed Salamander. Cheshire quartzite.

As we look closer, we notice *patterns*: how species are arranged on the landscape, as well as their relationships to both each other and abiotic elements such as soil, rocks, water, and sunlight.

Processes from cellular to global govern the patterns: pollination, nutrient cycles, land conversion, natural disturbance, migration, erosion, predation, reproduction, plate tectonics, climate change, and more.

This framework of pieces, patterns, and processes (PPP) helps us make sense of the living world around us. Through this lens, conservation becomes less about an individual species and more about preserving the processes that drive healthy ecosystem function.

This issue of *Field Notes* exemplifies how VCE's scientists think like naturalists. We'll show you some pieces, such as the marvelous color and diversity of butterflies documented in our Second Vermont Butterfly Atlas this summer.

We'll address some observable patterns and discuss the processes that drive them: how color pigments move through the food web; how insects and birds survive the northern winter (and things you

can do to support that critical process in your own backyard); and how a powerful natural disturbance like a hurricane affects birds.

Finally, you'll encounter how a scientific modeling project essentially brings pieces, patterns, and processes together to answer a fundamental and complex two-part question: What species are found where, and why? After months of computer work and data analytics, the work comes full circle. It still takes a biologist venturing back into the field to look at the pieces and validate our predictive models. We build these models to help us understand current and future species distributions, which in turn supports the work of forward-thinking conservation planners.

In essence, VCE is an organization populated—both in staff and its wider community—by naturalists. Our people (and that includes you) are incessantly curious and delight in the questions as much as the answers. Because we are paying attention, we wonder "Why?" That delicious question—along with the what, who, when, and where—fosters a lifelong pursuit to understand the world and our place in it.

As a member of VCE's staff for 13 years (and executive director for the past four), I've been honored to make this journey alongside so many of you.

By Susan Hindinger
EXECUTIVE DIRECTOR



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Saving the stems in your garden provides critical habitat for insects like cavity-nesting bees that lay their eggs in the hollow or pithy stems of perennial plants like this Wild Bergamot (*Monarda fistulosa*).

Winterize Your Garden for Wildlife Habitat

BY RYAN REBOZO, DIRECTOR OF CONSERVATION SCIENCE

With a few deliberate choices this fall, gardens can become a winter refuge for wildlife.

Gardeners who want to support biodiversity pay close attention to things like flowering time, structure (plants of different sizes and heights that are utilized by different species), and resources available for birds and pollinators, such as seeds, nectar, and pollen. As days get shorter and the growing season comes to its end, many of these same gardeners will rake, cut back, and otherwise “clean” their gardens in preparation for the dormant season.

But from a wildlife perspective, a clean garden is a barren one. The stems, leaves, seed heads, and brush that were

removed are the very infrastructure that carries the wildlife visiting your garden through the coldest months. And in northern New England, the time between first frost in the fall and last frost in the spring accounts for most of our year.

With a few deliberate choices this fall, gardens both large and small can become a winter refuge for wildlife and emerge more productive in spring.

Leave the Leaves

Fallen leaves provide structure and also feed the soil. Much like mulching rows in your vegetable garden, a layer of leaves can help insulate the soil before a winter snowpack develops. These leaves also provide shelter for a number of overwintering wildlife. Luna Moths (*Actias luna*) and many other silk moths pass the winter in cocoons wrapped in leaf litter. Woolly bear caterpillars (genus *Nyctemera*), firefly larvae (family *Lampyridae*), Red-banded Hairstreaks

(*Calycopis cecrops*), and countless ground beetles all depend on that layer. Salamanders, toads, and shrews forage and shelter beneath it. As these leaves are broken down by invertebrates and fungi, they become an important source of carbon and organic matter that feed the soil below.

If you do rake leaves from your lawn, you can redistribute them to your garden or under shrubs and trees to help build up that important leaf-litter layer.

Save the Deadheads

The dried stems of perennial plants are often cut back to produce a more manicured appearance in gardens. These stems are often either hollow or pithy, which make them great overwintering habitat for many insects, including bees.

More than a quarter of Vermont’s 352 bee species are thought to be cavity nesters. These bees, which include mason (genus *Osmia*) and leaf cutter (genus *Megachile*) bees, lay eggs in cavities such



©SUSAN ELLIOT

Luna Moths pass the winter in cocoons wrapped in leaves.

as hollow stems for their offspring to develop and emerge as adults the following year. Many of the native plant species commonly used in pollinator gardens fit this role, including elderberry (genus *Sambucas*), Spotted Joe-Pye Weed (*Eutrochium maculatum*), Wild Bergamot (*Monarda fistulosa*, which you might know as Bee Balm), and some native sunflowers.

These standing stems may also include seed heads that are an important food source for nonmigratory birds. Ever wonder what Wild Turkeys eat in the winter? When there's deep snow on the ground, flocks can often be found peck-

ing at dried seed heads from the previous year's growth. Coneflowers, asters, goldenrods, and native grasses hold seeds well into winter, drawing goldfinches, juncos, chickadees, and sparrows when other food is scarce.

A strategy for stems and limbs that do need to be cut would be to create a brush pile. This physical structure can provide overwintering cover for invertebrates, reptiles, and mammals alike. These can be tucked in corners of the yard to keep them out of sight and out of the way while still adding some structure to your landscape. Similarly, if a dead tree poses no hazard to structures or people, consider leaving it standing. Snags are particularly valuable wildlife habitat, hosting cavity-nesting birds, bats, and wood-boring insects that feed woodpeckers all winter.

Plant More Perennials

Fall is also a great time to plant native perennials. The cooler temperatures mean newly planted plants do not dry out as quickly, reducing the amount of watering needed. Planting in the fall also gives the plants enough time to overcome transplanting stress and establish themselves in their new soil, setting the stage for new growth the following year.



©RYAN REBOZO

Goldenrods, asters, and native grasses hold seeds well into winter, drawing in goldfinches and other songbirds.

Practice Patience

When spring arrives and it's time to work on the garden, try to give overwintering insects time to emerge. Cutting back stems or tilling soil too early in the season may destroy the nests of cavity- and ground-nesting bees, along with other beneficial insects. Species emerge in the spring at different times and at different rates. Look for a stretch of days that remain above 50 degrees as your sign that overwintering insects have emerged.

Doing less in your garden this fall can mean more: more nesting habitat, more bird food, and more overwintering wildlife. Incorporating these small changes means your garden can support biodiversity all 12 months of the year. **FN**

**More than
a quarter of
Vermont's bee
species are
thought to be
cavity nesters.**





©KENT MCFARLAND

Deciduous trees, like the Sugar Maple (*Acer saccharum*), are packed with carotenoids, which are drowned out by chlorophyll in spring and summer.

The Great Color Swap

What Vermont's Birds and Trees Share | BY MICHAEL T. HALLWORTH, DATA SCIENTIST

In the Northeast, both leaves and bird feathers get their warm colors from one substance: carotenoids.

Every autumn, people flock to Vermont and neighboring states to see the hillsides change from shades of green to hues of gold and scarlet. But most leaf peepers have unknowingly just missed an equally impressive color show. The vibrant yellows and oranges that set Vermont's hillsides ablaze each October have been there all along. We just couldn't see them.

The leaves of maple, oak, birch, and other deciduous trees are packed with warm-colored pigments called carotenoids. These are the same molecules that make carrots orange and egg yolks yel-

low. In the spring and summer, they're hidden in plain sight, drowned out by chlorophyll, the green pigment used by leaves to convert sunlight into nutrients. As the days shorten and temperatures drop, trees stop producing chlorophyll and the greens fade. The carotenoids are revealed, and the trees start to show their true colors.

The eye-catching yellow of the American Goldfinch, the stunning red of a Scarlet Tanager, and the Blackburnian Warbler's flame-throated, showstopping brilliance were built from carotenoids.

However, birds can't produce carotenoids. Only plants, algae, and certain fungi can. So birds and other organisms obtain carotenoids through their diet. Goldfinches get their yellow from seeds and other plant material. Tanagers get their red from fruit and from insects that themselves feed on plants. The carotenoids move up the food chain and are deposited into feathers when they molt or regrow.

That means that all summer long,



Blackburnian Warbler (*Setophaga fusca*)

BY ERIK SCHIFF (VIA NATURLAIST, PUBLIC DOMAIN)



BY ERIK SCHIFF (VIA INATURLAIST, PUBLIC DOMAIN)

American Goldfinch (*Spinus tristis*)

Vermont's forests have been shuttling carotenoids from leaves to caterpillars and eventually into the songbird feathers that are admired by millions of bird-watchers.

Carotenoids aren't just about color. In both birds and trees, they're doing critical biochemical work. In leaves, they help capture light and protect against damage to the machinery that converts sunlight into energy along the photosynthetic pathway. In birds, carotenoids serve as antioxidants and play a role in immune function. A male that grows especially vivid feathers isn't just beautiful; he's advertising to females that he found enough food, stayed healthy, and has spare pigment for display. It's an honest signal of quality.

As the hillsides ignite with colors in October, most of the migratory songbirds that spend the summer in Vermont replace their vibrant breeding feathers with a duller set for the long migratory journey ahead and the winter beyond. The male Blackburnian Warbler's blazing orange throat becomes pale and ordinary. The goldfinch dims from neon yellow to a soft olive.

Our attention, like the colors, passes from the dazzling feathers back to where

they originated: the leaves.

What to Look for in Vermont This Fall

Migratory songbirds don't replace their feathers (i.e., molt) all at once. The rate and timing of feather molt vary among species and individuals.

If you're able to take your gaze away from the fall foliage, you might notice the Yellow-rumped Warbler, for example. It is one of the last warblers to leave Vermont and often the most numerous fall migrant in the state. By October, they've already traded in their sharp spring markings for a streakier, duller look. Their namesake feature, however, persists: a yellow rump patch. You're likely to find them foraging on bayberries and wax myrtle (genus *Morella*) farther south to fuel their migration, but those fruits also help deepen and maintain their carotenoid-based yellow feathers.

The American Goldfinch undergoes a more dramatic wardrobe change. Through October, males move from their summer yellow to a patchy, half-molted state, then to their final winter plumage, which is mostly olive. If you're lucky enough to see a large flock in a field or at a feeder, you may witness the whole

gradient at once.

The Blackpoll Warbler, an abundant breeder atop Mount Mansfield (home to Stowe Mountain Resort) and other high peaks across New England, molts into a plain, streaky plumage resembling nothing like its crisp, black-capped summer self. You'll likely find them frantically foraging, trying to gather enough resources to fly nonstop for more than 60 hours over the Atlantic en route to South America.

A Fresh View of Familiar Colors

New England's famous leaf-peeping season may be brief (and as of late, unpredictable) before the onset of what some of us call stick season; but as you're admiring Vermont's hillsides this October, remember that the tree's true colors shine brightly every summer as warblers move through their branches, showcasing the carotenoids normally hidden from sight. **FN**



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Brian Kron and Colleen Clausen find one of their trail cameras in Allis State Park, Brookfield, Vermont.

Hiking Boots on the Ground

BY BRIAN KRON, POSTDOCTORAL RESEARCHER

Data analysis is crucial to conservation, but sometimes you just need to get out and into the field.

“It’s gotta be around here somewhere,” I mutter to myself as I wade through the dense brush in a remote area of Allis State Park in Brookfield, Vermont. Nearby, Ground-Truthing Technician Colleen Clausen shuffles through the waist-high herbaceous plants. We are immersed in stifling heat and humidity and surrounded by downed trees and branches. The forest floor has been completely taken over by dense growth since April, when we placed a trail camera and two autonomous recording units (ARUs) on the trees.

We’re traipsing through the for-

est to do what many scientists call “ground-truthing,” a fancy way of saying we need to confirm on the ground that what we’ve predicted on our computers is true. For almost two years, I’ve been working as a postdoctoral researcher with VCE Data Scientist Mike Hallworth and the Vermont Fish & Wildlife Department to map species distributions. The goal is to improve conservation and enhance Vermont Conservation Design, a project that identifies ecologically important areas across the state for conservation.

Our species distribution models combine multiple layers of data to identify areas that might have suitable habitat for different species. (You can read more about species distribution models and how we use them in an article I wrote for *Field Notes* last fall.) Last year, we secured a competitive grant from the Northeastern States Research Cooperative to ground-truth our distribution maps for 118 species. We’re hoping not only to find out how accurately our models predict the presence of a species, but



©FIONA MACLEAN

Colleen Clausen counts a beech tree during the study’s plant survey of Allis State Park, Brookfield, Vermont.

also to collect as much data as possible about the other species that inhabit these 40 locations. I, for one, was hoping to finally see a moose in person.

At remote locations across the Northern Piedmont and Northeastern Highlands regions of Vermont, we had set up a mini biodiversity monitoring station that consisted of a motion-detecting trail camera to capture mammals and birds, an acoustic recording unit that listened for bird songs and frog calls, and another recording unit tuned to detect the ultrasonic frequencies of bats. Now it's mid-June, and after two months of continuous recording, it's time to take them all down, and we have 39 more sites like this to visit.

With these locations up to 125 miles from the VCE office, this is just the beginning of three weeks and roughly 2,000 miles of travel to collect our equipment and find out just what kind of species Vermont's northeastern habitats are harboring. These three weeks will be spent alternating between the roaring of the road underneath the VCE field vehicle and the peace of the forest, with its smells of flowering trees, pines, soil,

and rain.

Suddenly, Colleen exclaims, "I found one!" It's our frog and bird recording unit, wrapped in orange flagging tape and zip-tied to a small tree about five feet from the ground. Sure enough, one after another, we find all three pieces of equipment, and we get to work.

We start by removing our camera and ARUs. Before I turn off our camera, though, I can't resist scrolling through some of the pictures we've captured. "We've got a bear!" I shout to Colleen. It's an exciting find for this suburban Philadelphia kid, and a welcome change of pace after a steady stream of pictures of White-tailed Deer and plants waving in the wind.

After packing up our equipment, we start a comprehensive survey of plants to finish off our inventory of the site. Colleen and I stand roughly 1.5 meters apart and walk slowly (with some scrambling over rocks and logs) while scanning the ground for plants that are on our list of target species. We then establish a 30-by-20-meter transect inside of which we measure the diameter of every tree trunk. We also estimate the coverage

of ferns and other ground-cover types. These data will help us better understand the habitat features that explain the presence of the species we observe or detect.

By the end of the season, we had collected almost 51,000 images and 17,000 recordings. We've so far identified at least 23 bird or mammal species in our images, including deer, moose, bear, and lots of Hermit Thrush. Once we analyze our audio recordings, we'll hopefully add plenty of frogs, birds, and bats to that list. These results will help us not only refine our models, but also provide valuable data to our conservation biologists who use these types of observations to develop stewardship strategies.

We caught at least a half dozen moose on camera, but I'm sad to say I have yet to see one in person. It might be too late—by the time you read this, I will be well into my first semester teaching biology at Walsh University in Ohio. But the team at VCE led by Hallworth will continue this project, and I'm grateful and honored to have been a part of this important work to protect Vermont's wild fauna and flora. **FN**

One of the half-dozen moose caught on VCE's trail cameras during the study



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What We Know About How Birds Navigate Hurricane Season

| BY JIM GOETZ, CARIBBEAN CONSERVATION COORDINATOR

“So devastating were these storms that we have little to report in the way of storm-blown birds: the affected areas were too damaged and inaccessible to permit birding, and many beloved birding and banding areas along the Gulf of Mexico coast were altered beyond recognition.”

—Brian L. Sullivan and Christopher L. Wood, “The Changing Seasons: A Plea for the Common Birds,” *North American Birds* (2005, vol. 59, no. 1)

The highest windspeed I’ve ever felt was back in 1996. On that clear day, I recall that the wind gauge on a lift to the east of Mount Mansfield’s ridge showed a steady 80 mph. When I saw the high-wind-speed reading, I was eager to go up and experience it myself. To my disappointment, it was not strong enough to lean into, but it did keep me off balance as I headed for the peak.

As VCE’s Caribbean conservation coordinator, I have been on the edge of a few hurricanes, but luckily never too close. When the tropical hurricane season rolls in each June, I think about the power of winds more than twice as strong as I’ve ever known and what it must be like to be a small songbird in that storm.

In the Storm

Severe storms create challenges for birds that are very similar to the difficulties people face. First, they must survive the storm and then survive its aftermath, with all the changes it has wrought on the neighborhood. Just like for people, there are long-term effects in the wake

of hurricanes that play out over years or even decades, which affect how well they survive or thrive in the place they’ve known as home.

As tough as birds are, surviving winds greater than 100 mph and driving rain can’t be easy. For most birds, the best option is to just hunker down in thicker vegetation and wait it out for a day or three. A healthy, dense forest is a songbird’s port in a storm.

Any birds that the storm sweeps up must keep flying until they find cover or the storm relents. “Storm-wrecked” birds may end up hundreds or thousands of miles from their native range. Such was the case in August 1893, when a Category 3 tropical cyclone struck New York City and moved up the Hudson Valley. In its wake, people in Virginia, central New York, Toronto, Vermont, and New Hampshire all found storm-wrecked Black-capped Petrels: crow-sized seabirds that—except for breeding season—live hundreds of miles out at sea. Similarly, in September 2008, Category 4 Hurricane Ike deposited a Magnificent Frigatebird—usually found in the



An observation of a storm-wrecked Magnificent Frigatebird (*Fregata magnificens*) in the Cayuga Lake basin, 2008

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Caribbean—on Cayuga Lake in central New York.

Unsurprisingly, neither the frigatebird nor the petrels survived very long. Although high-tech GPS tracking of frigatebirds has shown that they can fly for months without ever touching land, that works only when they can find food along the way. This one perished one day after it was first observed inland.

What about songbirds that may be migrating south as a hurricane comes north? There are two things that songbirds do to increase their chance of success before making big jumps across open water, such as the Gulf of Mexico or the Atlantic Ocean. First, they eat voraciously for a week or two to pile on fat that will power a flight that may last 30 hours or more. Blackpoll Warblers, for example, double their weight before migrating nonstop to South America. (For your typical car, this would be like having a 600-gallon gas tank!) Second, they wait for favorable winds. They are unlikely to take off right into a hurricane.

So what if a bird is already far off-

shore when it encounters the storm? Its fate might come down to luck. Because hurricanes in the northern hemisphere rotate counterclockwise, if the bird is on the west side of the storm, it may get a welcome tailwind that helps it on its way and saves energy. If the bird is on the east side, it will encounter stiff headwinds and will likely be in big trouble.

After the Storm

As with the frigatebird, surviving the storm is only the beginning. Birds that took shelter for a few days during the storm urgently need to build their energy back up but often find that nature's larder is bare. Intense winds can flatten whole forests, but even moderate hurricane winds break branches and can strip trees of every last leaf, fruit, and flower. Insect populations may bottom out as well.

Populations of nectar-eaters such as hummingbirds and fruit-eaters such as parrots typically plummet after hurricanes, and they may take years to recover. In the tropics, leaves take at least a few weeks to grow back on the branch



No one has seen a Bahama Nuthatch (*Sitta insularis*) since a 2019 hurricane wiped out its favored habitat. This observation is from 2007.



Blackpoll Warblers (*Setophaga striata*), like this one seen wintering in Antigua and Barbuda, double their weight in preparation for their fall migration over the Atlantic Ocean.

stubs of surviving trees, and a whole year's fruit crop may be lost.

Anywhere that a violent storm has leveled a forest, it will take decades—if not centuries—to return to prestorm conditions. Birds that nest in cavities in large trees may disappear from the area. Even if they stick around, they may fail to breed successfully. Along the shore, storm surges can flood forests with salt water that can wipe out large swaths of coastal vegetation. High winds can physically spread invasive species, and the way that hurricanes can set the clock back to zero for ecological succession can provide the perfect opportunity for invasive grasses and shrubs to get a toehold.

In the worst case, populations do not recover. For dozens of species in the Caribbean that are confined to small islands with reduced populations and degraded habitat, extinction may be just one big hurricane away. In 2019, Hurricane Dorian, a Category 5 storm, hit the Bahamas with 185 mile-per-hour winds and wiped out the Caribbean Pine habitat of Bahama Nuthatches. No one has seen them since.

This article's opening observation by

Sullivan and Wood, made in the aftermath of the devastating hurricanes Katrina and Rita, points out an abiding challenge for scientists who seek to understand the impact of hurricanes on wild populations of birds and other wildlife and their habitats: It is not easy to collect data in the wake of a hurricane because the access is difficult and often dangerous. Local people—even the most ardent bird lovers—are fully focused on their own recovery and helping their neighbors.

What We Can Do Before the Storm

Another challenge is that many areas swept by hurricanes had scant data on the health of bird populations before the hurricanes did their damage.

Data collection using platforms such as eBird, iNaturalist, and iButterfly won't totally solve the problem, but it can help a lot. So before hurricane season really gets started, make sure to get out there and eBird and iNat! [FN](#)



©JILL DEVITO

Common Ringlet (*Coenonympha californica*)

Vermont Butterfly Atlas

When the Prize Flies Away | BY JILL DEVITO, SEASONAL BUTTERFLY ATLAS TECHNICIAN

I learned of the Second Vermont Butterfly Atlas at a VCE community science workshop in 2024. It was butterfly weather (warm and sunny), and we romped through waist-high vegetation in search of midsummer butterflies. To my amazement, we found 17 species in a few hours. I also learned a new trick: how to get a good look at a butterfly by capturing it in a net and holding it in a clear container for a brief photo session.

The VBA2, as we call it, is a five-year survey to document how butterfly diversity and distributions may have changed since the first Vermont Butterfly Atlas 20 years ago. This past winter, I found out that VCE was hiring a full-time seasonal technician to help supplement the volunteer data-collection effort. As an ecologist and nature nerd, I imagined spending my whole summer in the field—on a monthslong easter egg hunt during which the brightly colored treasures

try to fly away—and decided to throw my hat in the ring. I knew I had a lot to learn about butterflies, but that would be part of the fun. After hearing I had made the team, I decorated my fridge with a hundred illustrations of butterfly species I might encounter in the state.

In the months that have passed since my first day in May, I've gotten to know the insects on their own terms. I've swung my net at thousands of butterflies in the fields and flowers and forests of Vermont—from village centers to wetlands and mountaintops. Sometimes I head out alone, but more often I'm with my new friends on the VCE butterfly team or with community science volunteers.

I've graduated from being able to only tell a fritillary (tribe *Argynnini*) from a swallowtail (subfamily *Papilioninae*) to recognizing the field marks that set each fritillary species apart from the



©JILL DEVITO

Jill DeVito (right) and Vermont Butterfly Atlas volunteers Hayley Kolding (left) and Hale Morrell (center)

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Vermont Butterfly Atlas

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others. I can now distinguish among a dozen closely related and highly variable skippers (family *Hesperiidae*). I've taken thousands of butterfly photos with a macro lens attached to my smart-phone—my favorite part of the job. I've entered more than a hundred checklists into eButterfly, so that atlas managers (and anyone else) can utilize the data our

team has collected in the field.

Most importantly, I've discovered that looking *for* butterflies is not only more challenging but also much more exciting than looking *at* butterflies when they happen to cross my path. All butterflies are elusive, but there are many species you'll simply never notice until you really spend the time looking for them. **FN**



Viceroy (*Limenitis archippus*)



Painted Lady (*Vanessa cardui*)

Vermont Center for Ecostudies is a nonprofit organization that advances biodiversity conservation in the Northeast and across the Americas through research, monitoring, and community engagement. This free magazine showcases just a fraction of the work VCE's scientists do.

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