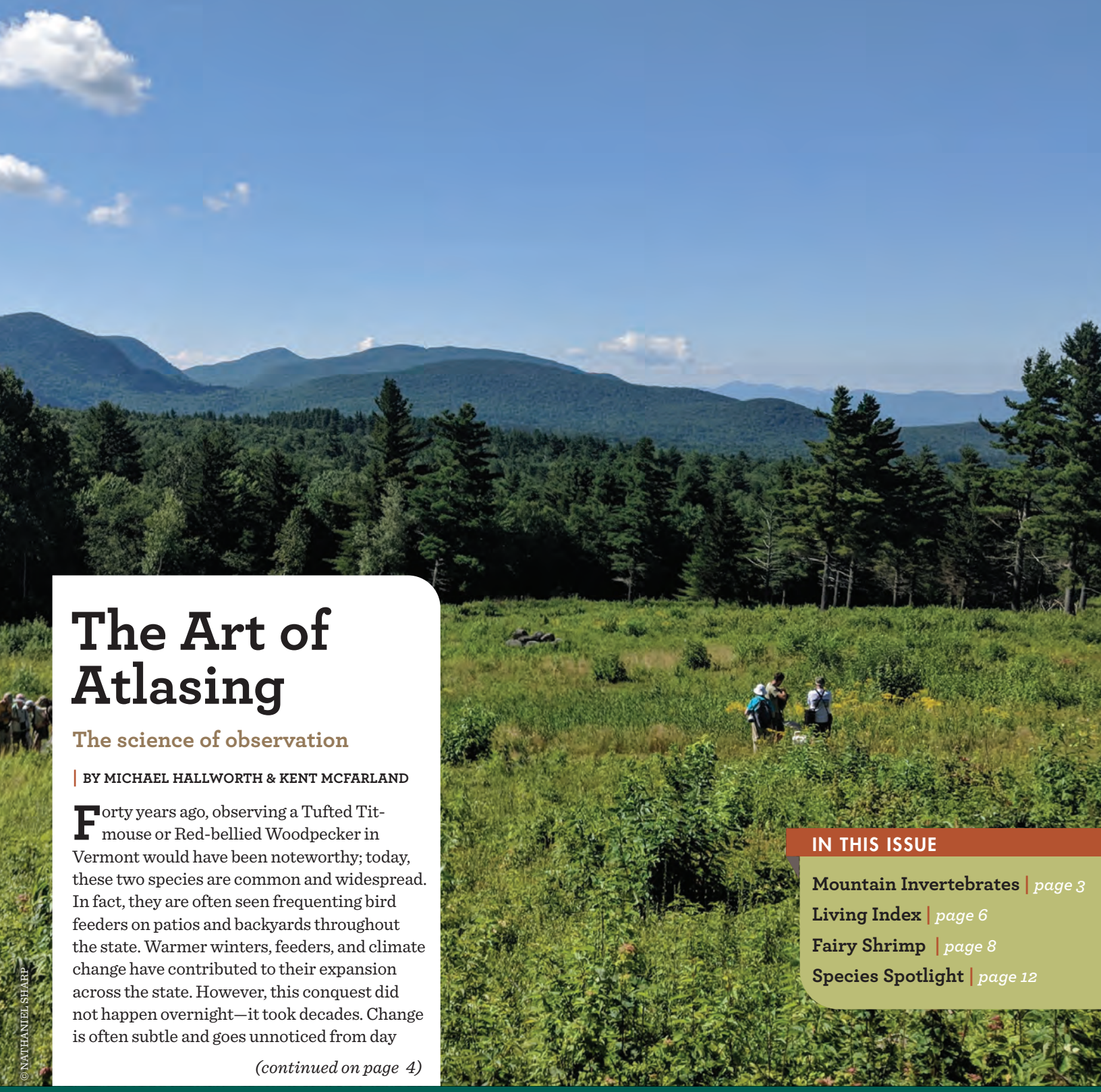
SPRING 2023

Field Notes

VERMONT CENTER FOR ECOSTUDIES | *Uniting People and Science for Conservation*



The Art of Atlasing

The science of observation

BY MICHAEL HALLWORTH & KENT MCFARLAND

Forty years ago, observing a Tufted Titmouse or Red-bellied Woodpecker in Vermont would have been noteworthy; today, these two species are common and widespread. In fact, they are often seen frequenting bird feeders on patios and backyards throughout the state. Warmer winters, feeders, and climate change have contributed to their expansion across the state. However, this conquest did not happen overnight—it took decades. Change is often subtle and goes unnoticed from day

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FIELD NOTES

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The Vermont Center for Ecostudies (VCE) is a nonprofit organization whose mission is to advance the conservation of wildlife across the Americas through research, monitoring, and community engagement. With a reach extending from Canada and northern New England through the Caribbean and South America, our work unites people and science for conservation.

Field Notes is VCE's free biannual newsletter.

VERMONT CENTER FOR ECOSTUDIES
PO Box 420
Norwich, VT 05055
(802) 649-1431

VCE VIEW

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I returned recently from a VCE field excursion to the tropics with a host of iNaturalist observations, eBird checklists, and eButterfly records to upload. Scrolling back through the images evokes the sights, sounds, and scents of the places they were captured. I found myself playing an educational and wholly satisfying game, puzzling over the identifications of unfamiliar species and monitoring iNaturalist for ID confirmations and corrections.

Back in grad school, I'd return from such a trip with a 4-inch square Rite-in-the-Rain notebook. After sometimes enduring a turn in the washer in the back pocket of my field pants, the invaluable notebook would be stashed on a shelf among field guides. I have dozens of those, with bird lists scribbled in pencil, locations and dates noted, and sometimes the names of my field companions as well.

Recording field observations has changed over the years. My checklists from back in the day lacked precise coordinates and were never accessible to other scientists. If a photo accompanied an observation, it was usually in the form of a slide. If a species was misidentified, there weren't many opportunities for another observer to correct it.

Now we can precisely georeference our observations with phones, cameras, or watches. Digital tools like iNaturalist, eBird, and eButterfly allow us to share georeferenced data with voucher photos almost instantaneously. Avid users enrich their contributions by adding details like breeding codes and species interactions.

Yet, for all their scientific value and convenience, digital tools are no substitute for personal interactions. Many of us who participate in Christmas Bird Counts relish not only the joy of a day spent birding, but also the camaraderie of the evening countdown when we share observations with fellow participants. Birding with friends is why VCE's Birdathon is one of my favorite days of the year. There is no better way to foster a sense of community than observing nature in the company of others.

A virtual community has sprung up in Vermont as the use of iNaturalist has blossomed here. But how many iNat users have you met in person? Since we at VCE are big fans of community science and community building, we thought it would be fun to enhance this virtual community with some face-to-face community. That's why we are teaming up with the good folks at North Branch Nature Center in Montpelier for a Biodiversity Jamboree. Mark your calendars: Saturday, June 10th.

Wield a butterfly net with Kent McFarland, explore fungi with Pete Kerby-Miller, and learn about bees or garden pests from Spencer Hardy. Sharpen your iNat skills with iNat(haniel) Sharp! Discover caterpillar diversity with Desiree Narango. We'll have a day packed with activities, workshops, field walks, and displays for all ages and experience levels, staffed by experienced scientists, naturalists, and educators from VCE and NBNC. And we'll top off the day with a presentation by the incomparable Douglas Tallamy! Whether you bring your pencil and field book, your phone, camera, binoculars, or just your eyes and ears, I hope to see you there!

Susan Hindinger
EXECUTIVE DIRECTOR

Invertebrate traps being placed in the air by VCE ECO AmeriCorps member Abbie Castriotta

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Invertebrate Network Crawls into Existence

Exploring bird-invertebrate interactions in Vermont's spruce-fir ecosystem | BY JASON HILL

Each bird species' abundance was associated with one or two specific groups of invertebrates.

© JASON HILL

Stop for a moment, and consider something underappreciated in your life. Got it? Perhaps this person or object enables you to pursue your passion or to do your job better. What comes to mind for me are hiking trails, critical pieces of infrastructure that support my research. My work in montane ecosystems would simply not be possible without them. I recently had the honor of speaking at a Green Mountain Club meeting where I thanked a few of the many folks that build and maintain the backcountry infrastructure that facilitates montane research.

Last summer, Abbie Castriotta (VCE's former ECO AmeriCorps member) hiked up and down mountains to complete the first full field season of our Montane Invertebrate Network sampling project. The overall goal of this work is to clarify the relationship between montane bird and invertebrate communities. Sampling takes place at 42 high-elevation sites located along VCE's Mountain Birdwatch routes, where community scientists conduct point counts for montane birds each June. Using pitfall and aerial insect traps, we collected just over 5,000 invertebrates, hiked them out, and painstakingly identified them under a microscope back in the lab.

In total, we captured invertebrates from at least 14 taxonomic orders, and we now have the clearest image yet of the structure of our montane invertebrate community. After the microscope marathon was over, we found that almost 60% of these invertebrates were flies and 18% were beetles. I was surprised at how similar the communities were across the 42 sites. I examined the data for a relationship between invertebrate community characteristics and the abundance of six bird species of the spruce-fir zone, including Blackpoll Warbler (*Setophaga striata*) and Bicknell's Thrush (*Catharus bicknelli*). Contrary to our expectations, invertebrate community diversity and total invertebrate biomass were poor predictors of bird abundance.

Instead, each bird species' abundance was associated with one or two specific groups of invertebrates. For example, Swainson's Thrush numbers were higher at locations with lots of Hymenoptera (ants, bees, wasps, and sawflies), an important food group for this species. Although it was not our primary goal, we were also the first folks to document more than a dozen invertebrate species in Vermont and New Hampshire, including Upland Blackclock (*Pterostichus adstrictus*), a ground beetle, and *Metanomus insidiosus*, a member of the click beetle family. We're already looking forward to the next field season in 2023, when we'll continue to deepen our understanding of the spruce-fir ecosystem, accessed via hiking trails. Thank you to all the trail clubs and organizations that make the mountains accessible to the rest of us. FN

VCE biologist Kent McFarland speaks to a group of participants during a VCE field trip to Blueberry Hill Inn.

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Butterfly distributions in Vermont were largely a mystery before the first atlas. The knowledge gained from a second atlas will help us understand how butterflies in Vermont have changed over the past two decades.

to day and even year to year. However, when examined across a long span of time, the results can be eye-opening.

Every 20 years, Vermont Center for Ecostudies staff, working alongside hundreds of volunteers, sling binoculars over their shoulders, grab sweep nets and cameras, and scour the state to document a targeted group of organisms. These systematic statewide surveys, which take multiple years to complete, are known as atlases. An atlas is a standard status assessment, meaning that every area is surveyed multiple times, during a specific time period. Atlasing, as a concept, began with birds and has since been applied to other taxa. Vermont is at the forefront of collecting this type of data and has already completed two breeding bird atlases (1976-1981, 2002-2007), a bumble bee atlas (2012-2017), and a butterfly atlas (2002-2007).

This year, VCE will uphold Vermont's position at the forefront of community data collection by leading a second butterfly atlas for the state. Butterfly distributions in Vermont were largely a mystery before the first atlas, despite the lofty status of this fluttering group among insects. A second atlas unlocks a new and important type of information: trends. The knowledge gained from a second atlas will help us understand how butterflies in Vermont have changed over the past two decades. If each atlas acts as a snapshot of data, frozen in time, then comparing two atlases side-by-side will allow us to see differences between the two. For example, we may find new butterfly species that occur in Vermont today that were not here in the first atlas and vice versa. We'll also be able to show how butterfly distributions within Vermont have changed in the last 20 years with data that could help us understand how certain species are responding to changes in climate and landscape use. The results from this second atlas will play an important role in conservation decision-making and assist insect conservation efforts.

Conducting a statewide atlas is different from submitting observations of organisms you encounter in your travels, although those records can play a supporting role in the project. Atlases are systematic, rigorous surveys documenting where species do and do not occur (both are critical to ascertaining true distributions and trends). For each survey, a checklist of all observed species is submitted, providing the information needed to identify which species are present, but also which ones have not been observed in a location. Altasing offers other types of valuable information as well, like confirmed and possible breeding sites. Atlases are invaluable for tracking changes and identifying species trends. However, they are monumental undertakings that require a concerted effort to ensure that the entire state, broken up into survey blocks, is adequately surveyed.

Every butterfly observation submitted between January 1, 2023, and December 31, 2027, will become part of Vermont's second butterfly atlas. We'll take any occurrence records we can get our hands on because we have our work cut out for us. Vermont has over 1,000 survey blocks that must be surveyed multiple times over the next several years. Anyone can help by submitting butterfly observations to eButterfly.org. You don't need to be a butterfly expert—all you need is a sense of adventure, a willingness to learn new things, and an interest in the natural world.

Keep an eye out for butterflies that overwinter as adults. They are the first species to take flight each spring and are the first butterflies observed in the state each spring. Mourning Cloak, Eastern Comma, Gray Comma, and Compton Tortoiseshell make up the list of the first observed butterflies each spring since 2015. These species fly early, too. The first observations of these species start as early as March 5 or as late as April 21 depending on the conditions. FN

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The Status of Insects

VCE joins the conversation at the American Museum of Natural History. | BY DESIREE NARANGO

In early February this year, I was invited to join the Status of Insects International Research Coordination Network (Insect-RCN) for its inaugural meeting at the American Museum of Natural History in New York City. Insects are declining around the globe due to the compounding effects of climate change, land development, pesticides, non-native plants, pollution, and more. The Insect-RCN was created to weave a network of people from all over the world working on research, education, conservation, or policy related to insect declines to seek innovative and collaborative solutions.

The Insect-RCN is a new venture, so this was an opportunity to meet others, learn about their work, and plan next steps. Attendees gave talks about insect trends in the United States, Panama, Costa Rica, and South Africa. Unfortunately, few trends were positive; however, one common thread was the value of community science for conservation. For example, iNaturalist data on butterflies in the western US is being used to identify 'biodiversity hotspots' for land conservation (similar to the Important Bee Areas identified in VCE's recent State of the Bees report). Conversations with the butterfly folks out west left my mind buzzing with new ideas for approaches here in New England. Here at VCE, the Vermont Atlas of Life (VAL) team is taking a similar approach to modeling, with the help of iNaturalist observations and Vermont Butterfly Atlas data.

My talk described the links between insect declines and vertebrates, focusing on a topic I think about a lot in my research program: insects as essential prey for birds. Insects and other invertebrates are key to bird conservation because they are important food items during critical periods like breeding, migration, and surviving the winter. At least 70% of all birds globally feed on insects and other invertebrates—that's more than 7,000 species! When we look at bird populations, the species that primarily eat insects—like warblers, flycatchers, swallows, nightjars, sparrows, and more—are facing the steepest declines. However, linking insect declines to bird declines is not easy, and it requires better communication and collaboration among community scientists, entomologists, and ornithologists, which is something this RCN will be focusing on!

The Insect-RCN and its working groups will hold regular meetings in the coming months to tackle one of the greatest challenges in biodiversity research and conservation, and I'm excited to be involved. Through VAL, the Vermont Butterfly Atlas, bumble bee surveys, mountain-based studies, vernal pool monitoring, our outreach programs, and more, VCE is working on many projects that can directly inform how we address insect conservation, perceptions, and solutions for policymakers. I'm looking forward to being part of the conversation about the next steps we can take as an organization for preserving the little things that run the world. FN

What Does the Stock Market Have to do with Conservation?

More than you might guess.

BY EMILY ANDERSON

Tracking the status of wildlife is critical for understanding the health of ecosystems on which we rely and understanding those animals and places that are most in need of conservation action.

I know—you didn't turn this page expecting to see the words "stock market." But hear me out.

Since 1997, biologists have honed a tool that is surprisingly analogous to stock market indexes: the Living Planet Index (LPI). Much like market indexes, LPI averages trends to develop a snapshot of how the overall system is doing. However, instead of stock trends, LPI gathers trends in the abundance of land-based vertebrate species from hundreds of monitoring projects worldwide.

Over the years, advances in technology and expansion of biodiversity monitoring have enhanced LPI's performance, turning it into a powerful statistical tool. As VCE Conservation Biologist Kent McFarland says, "The index works pretty darn well." So well, in fact, the Fifteenth Convention of Parties (COP15) adopted LPI as one of their main monitoring mechanisms to track whether countries successfully reach the targets set in the Global Biodiversity Framework (adopted December 2022).

Inspired by LPI's model, VCE's Vermont Atlas of Life (VAL) team has launched the Living Vermont Index (LVI), which will mirror LPI on a statewide scale for all wild species. From this project, the team hopes to understand what species are currently monitored within Vermont, create an index of biodiversity trends for species with sufficient monitoring data, and identify species needing additional monitoring now and into the future.

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"We don't even know what monitoring projects are in our pantry," explains McFarland. "Once we figure out where the gaps are, we can think about expanding monitoring efforts to cover understudied taxonomic groups so that we get an increasingly clear picture of what is really going on with biodiversity overall."

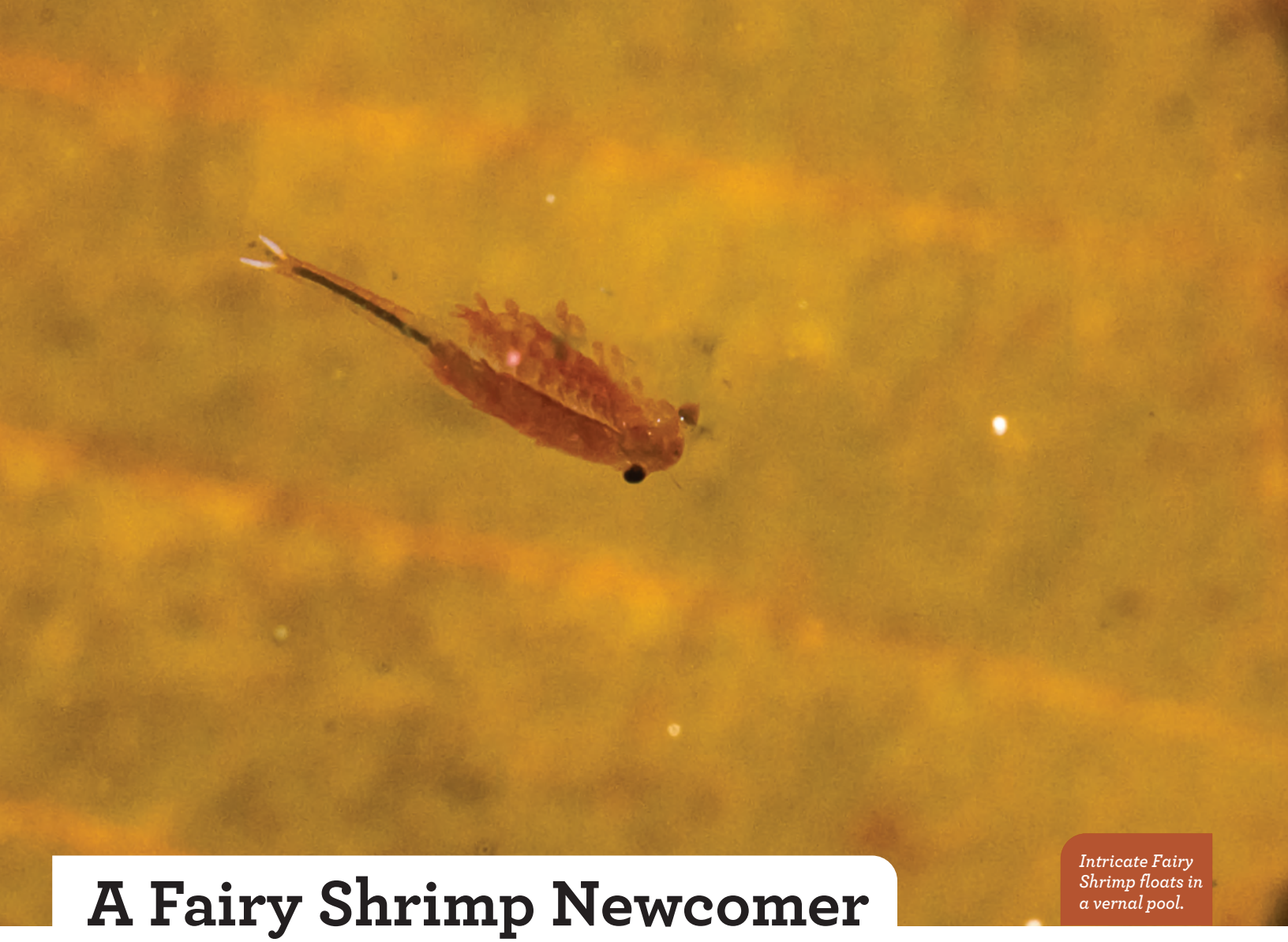
The fact that long-term monitoring projects are VCE's bread and butter is no coincidence. Monitoring wild flora and fauna is critical for understanding the health of the ecosystems on which we humans rely and for identifying species and places most in need of conservation. Over time, monitoring efforts also allow scientists to determine whether conservation efforts are working.

The building blocks for this index are stored in the Living Vermont Database, an ever-growing catalog of population monitoring schemes and primary data gathered from a range of sources. Ultimately, VAL seeks to unite as many monitoring projects as possible to build LVI.

"One of our challenges is ensuring we have robust data for as many taxonomic groups and regions as possible," says McFarland. "While there are comprehensive monitoring projects for some species in Vermont, especially birds, records of population trends for many groups are sparse."

If you want to learn more about LVI and how to contribute data, please visit val.vtecostudies.org/living-vermont-index/. FN

© STEVE FACCIO



Intricate Fairy Shrimp floats in a vernal pool.

A Fairy Shrimp Newcomer

Fairy Shrimp Survey results in new species for Vermont.

BY **STEVE FACCIO**

We found the Intricate Fairy Shrimp at six pools located in Pomfret, Sharon, Strafford, and Berlin.

Last spring, we initiated the Vermont Fairy Shrimp Survey as part of our ongoing efforts to understand vernal pool ecology and promote the conservation of these tiny wetland jewels. We also wanted to determine what specific species of these enigmatic crustaceans are present in Vermont. Thanks to their spotty distribution and brief yet erratic lifecycle—appearing in droves for just a few weeks one year, and practically mythical the next—finding and studying these vernal pool specialists is a challenge.

During our surveys last spring, we visited 26 vernal pools in seven counties across the state where Fairy Shrimp had been previously reported and collected specimens at 19 of these pools. Fairy shrimp were not present at seven pools, many of which were gone, or nearly gone, thanks to an exceedingly dry May. Our results confirmed the presence of the Knob-lipped Fairy Shrimp (*Eubranchipus bundyi*), the only species to be documented in the state previously. However, we now know Vermont also supports the Intricate Fairy Shrimp (*Eubranchipus intricatus*), also known as the Smooth-lipped Fairy Shrimp. Both species are widespread across North America in vernal pools and other temporary wetlands with low levels of salinity, but the Intricate Fairy Shrimp is considered rare in Massachusetts, where it is listed as a "Species of Special Concern."

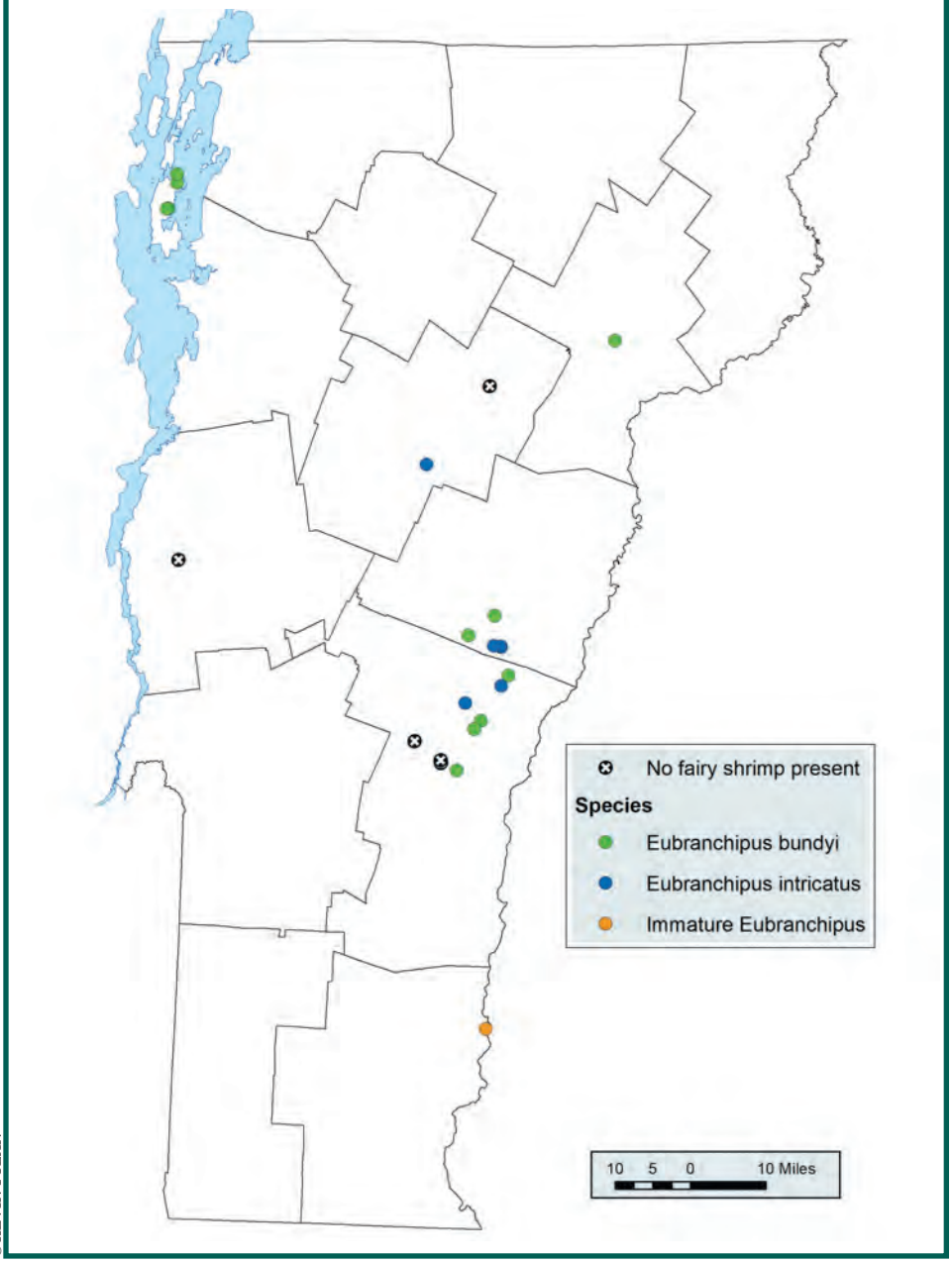
We found the Intricate Fairy Shrimp at six pools located in Pomfret, Sharon, Strafford, and Berlin. The Knob-lipped Fairy Shrimp was much more widespread, occupying 12 pools from the Champlain Islands, west to Danville, and south to Woodstock (Figure 1). The shrimp we collected at a pool in West-

© NATHANIEL SHARP

minster, the southernmost pool sampled, had not yet reached the adult stage, so they could not be identified to species by our partner on this project, Dr. Christopher Rogers of the Kansas Biological Survey, North America's foremost expert on Branchiopods. The Westminster pool was a site where we had hoped to find the Spring Fairy Shrimp (*E. vernalis*), which is common in Massachusetts and southern New England. We also hoped to find the Holman Fairy Shrimp (*E. holmanii*), which has been documented in New York and Quebec.

Our plans for this year include resampling at pools that dried early last year and surveying additional pools in different regions of the state. You can help by letting us know if you've seen these fascinating crustaceans anywhere in Vermont. FN

Fairy Shrimp Locations



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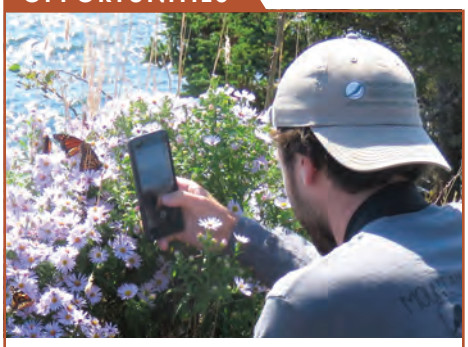
COMMUNITY SCIENCE OPPORTUNITIES



© SUSAN HINDINGER

You don't need a background in science to be a community scientist!

From backyards and bogs to mountains and meadows, you'll find many ways to get involved and make a real contribution to wildlife conservation. If you'd rather not muck around a swamp or hike to a summit, you can still volunteer for VCE—even from the comfort of home.

We hope you'll join us!

iNaturalist Vermont

Volunteers share observations of all Vermont biodiversity in this digital project of the Vermont Atlas of Life.

www.inaturalist.org/projects/vermont-atlas-of-life

Mountain Birdwatch

Each June, volunteers hit the trails to complete bird survey routes on 123 mountain ridgelines across the Northeast.

vtecostudies.org/projects/mountains/mountain-birdwatch

Vernal Pool Monitoring

In April, May, and September, volunteers visit their "adopted" vernal pools and collect data, following standard protocols and using VCE-provided equipment.

vtecostudies.org/projects/forests/vernal-pool-conservation

To learn more about the Vermont Atlas of Life and its projects, visit vtecostudies.org/volunteer.

The Search is On!

The Vermont Butterfly Atlas is taking flight for a second time.

BY NATHANIEL SHARP

With many new technologies available that were not around during the first atlas, butterfly observation has never been easier.

Insects are declining globally in what some have called the "insect apocalypse." While birds, mammals, reptiles, and other organisms receive a great deal of attention from scientists and the media alike, invertebrates often get overlooked. Twenty years ago, the Vermont Butterfly Atlas looked to change that by mobilizing a dedicated base of 150 butterfly enthusiasts to document butterflies across the state. The 36,000+ butterfly observations from the first atlas informed new distribution maps, abundance estimates, and conservation statuses, and resulted in the discovery of several new species never before recorded in Vermont.

Since the first atlas, several more new species have been added to the state butterfly list, many of which were found in backyards or roadside meadows. Butterflies can be found anywhere there are flowers, so just about everywhere! You can enjoy watching butterflies anywhere in the state, from your flower garden and local nature preserve to the peak of Mount Mansfield and the bogs and fens of the Northeast Kingdom. Butterflies, like many of us, prefer warm weather, sunny days, and light breezes. This makes beautiful spring and summer days ideal for getting outside and documenting butterflies in your backyard, neighborhood, or further afield.

With many new technologies available that were not around during the first atlas, butterfly observation has never been easier. The powerful smartphone cameras many of us now have in our pockets can take crisp and identifiable photos of most Vermont butterfly species, with some patience and stealth on the photographer's part. Keeping track of your butterfly observations is now easier than ever with eButterfly. By using the app, butterfly enthusiasts can get identification help from experts and advanced AI tools, track their butterfly life list, view distribution maps, and more. This app also happens to be contributing valuable butterfly data to the atlas.

The first sunny days of spring have already started to open the butterfly

© KENT MCFARLAND

© KENT MCFARLAND

floodgates, with Mourning Cloaks (see page 12), Compton's Tortoiseshells, and a handful of other species already reported in Vermont this year. Now is the perfect time to get involved with the atlas and document your local butterflies. If you're curious about contributing butterfly observations to the atlas, visit the Second Vermont Butterfly Atlas website, where you can find recorded webinars, a list of upcoming events, atlas survey protocols, and other helpful tips and tricks for finding and identifying butterflies. FN

A NEW FACE AT VCE

Development Coordinator

ALYSSA FISHMAN

This winter, VCE welcomed Alyssa Fishman as our new Development Coordinator. Encouraged by her parents' interests in marine ecosystems, Alyssa has long been curious about ecology and conservation. Over time that love evolved into a passion for farming and managing agroecosystems. Along the way Alyssa earned a B.A. in Ecology and Evolutionary Biology, a B.A. in Neuroscience, and a M.S. in Sustainable Food Systems, and gained a wealth of experience as an educator and farmer. She even owned a cut flower farm in Montana. When Alyssa decided to explore another area of interest—nonprofit fundraising—in her new Vermont home, we were delighted to welcome her aboard. Welcome, Alyssa!

FIELD NOTES
VERMONT CENTER FOR ECOSTUDIES
PO BOX 420
NORWICH, VT 05055

Mourning Cloak {*Nymphalis antiopa*}

The warm rays of spring arrive on gold-leaf wings.

BY NATHANIEL SHARP

How do you know when spring has "officially" sprung? Vermonters know that the transition from winter to spring is full of mud, false springs, and brief regressions back to winter temperatures before the transformation is finally complete. Do you keep an ear tuned for the calls of Spring Peepers? Maybe you watch for the emergence of your neighborhood daffodils or the spring-beauty flowering in your woods. For many birders, the first Red-winged Blackbirds or the steady ramping up of bird song signals that spring is not far off.

Yes, spring technically begins here in the northern hemisphere on March 20, the spring or 'vernal' equinox. However, for me and other butterfly-watchers across Vermont, there is no more welcome sign of the season's change than the first Mourning Cloak. On deep-brown wings flecked with electric blue spots and edged in shimmering gold, these harbingers of spring flutter softly along the forest floor, occasionally landing with wings outstretched to soak up those first warm rays of sunshine.

These butterflies are able to arrive so early on the scene thanks to specialized adaptations similar to another seasonal favorite, the Wood Frog. Mourning Cloaks are able to displace enough water in their bodies to avoid freezing solid during the winter thanks to a buildup of lipids (body fat) and glycerol (antifreeze). The majority of butterflies in Vermont overwinter as either an egg, caterpillar or chrysalis, but Mourning Cloaks can overwinter as adults. When spring does finally arrive here in the north, most butterflies need to undergo a time-intensive stage of metamorphosis before emerging. While they expend all of that energy and time, adult Mourning Cloaks simply wait for the first warm days of spring, tucked snugly under the bark of a tree, or deep in a sheltered woodpile.

This year, reports of spring's first Mourning Cloaks will be more important than ever, as they will represent the kickoff of the Second Vermont Butterfly Atlas. If you're lucky enough to come across one of these winged gems on a spring walk, be sure to photograph it and report your sighting to eButterfly, a global online database. Tools such as eButterfly and VCE's new Atlas Block Mapper will help us produce a thorough statewide census of Vermont's butterfly diversity. Together we can seek new butterfly species for Vermont, determine which species are declining and in need of protection, and perhaps even find the earliest record of a Mourning Cloak after this mild winter. Happy hunting! FN