

Field Notes

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

Racing Extinction

Documenting Vermont's Bee Species
in the Anthropocene

| BY KENT MCFARLAND

Marked by the world's sixth mass extinction, we've entered a new era that many are calling the Anthropocene. At approximately 100 extinctions per million species annually, the current extinction rate is 1,000 times higher than the natural rate—and many species are disappearing before we even know them. A recent United Nations report revealed that human activity now puts one million species of plants and animals at risk of extinction.

Among insects alone, we have named about one million species worldwide, with an estimated five million remaining to be discovered and classified. And, we don't need to travel to exotic locales to find them.

Surprising as it may be, we are still discovering species new to science—insects and other taxa—right here in Vermont. The ground beetle *Bembidion rothfelsi* was discovered in 2008 by Dr. David Maddison in Bridgewater, birthplace of Zadock Thompson, Vermont's first official naturalist. In 2011, three new springtail species were discovered by Dr. Felipe N. Soto-Adames, who collected two on a sandy beach along Lake Champlain and one in a newly constructed wetland. In 2010, the Green Mountain (continued on page 10)



Pruinose Squash Bee ▲

IN THIS ISSUE

Vermont Moth Atlas | page 3

A Community Pulls Together
for Grassland Birds | page 4

2020 Loon Update | page 6

Species Spotlight | page 12

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 biannual newsletter and is free to our constituents.

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VCE VIEW



© MICHAEL SARGENT

Given the profound turbulence and uncertainty that have pervaded every aspect of life in recent months, it is heartening to report—in no uncertain terms—that VCE maintains a steady, strong course. Despite staff having had to shelter-in-place since mid-March, communicating weekly (or more often) via Zoom, we've adapted remarkably well, and in many respects gained cohesion and purpose from the challenges COVID-19 has thrown our way. We fully acknowledge, and are deeply grateful for, VCE's relative insulation from the pandemic's harshest impacts, and we sincerely believe that we have leveraged this good fortune to further advance our conservation science agenda.

Needless to say, most of us at VCE have, like so many others, found personal solace and rejuvenation via deeper, more frequent forays into the natural world. Simultaneously, "business" has proceeded apace. Our wildlife conservation work has taken on new dimensions, and gained added meaning for us. Our commitment to become a more diverse, equitable and inclusive organization (see vtecostudies.org/about-us/dei-statement) represents a small, but significant step. Several developing partnerships hold great promise. On the scientific front, our Vermont Atlas of Life continues to push boundaries, from wild bees, to lady beetles, to a hemispheric expansion of eButterfly. Monitoring of vernal pools, mountain birds, loons,

and Whip-poor-wills has taken on new urgency, as the climate crisis looms large for all of us.

We may not know whether we'll fully reoccupy our Norwich office in 2021, but we do know the year ahead will feature key additions to our core team. In January, a new Director of Conservation Science and our first-ever senior Data Scientist will bolster the VCE ranks. By mid-year, we'll bring on a PhD-level Conservation Biologist, enabling us to pursue new lines of cutting-edge research. And by year's end, we'll add a science writer to the communications team to ensure that our findings translate to effective messaging beyond the peer-reviewed journals—reaching policy-makers, natural resource managers, and you, our constituents.

As we collectively navigate this period of struggle, facing so many unknowns, VCE's ambitious mission compels us to grow, and diversify. Our attention is appropriately drawn to emergent public health issues and the needs of others, but the clarion call for science-based conservation rings louder than ever. We will answer that call with energy, resolve, and profound gratitude for the support of so many who find a way to participate in and support VCE's work, even in the midst of a global pandemic. **FN**

Chris Rimmer
EXECUTIVE DIRECTOR



© JOANNE RUSSO

Vermont Moth Atlas

Moths represent an astounding array of diversity in Vermont

BY NATHANIEL SHARP

From miniscule “micro-moths” that are only a few millimeters long, to impressive giant silk moths like the famous Cecropia Moth that stretches a full six inches from wingtip to wingtip, moths represent an astounding array of diversity in Vermont. These beautiful, mostly nocturnal insects have inspired a statewide network of moth-watchers who have amassed a monumental amount of data over the years.

We at the Vermont Atlas of Life wanted to gather all of Vermont’s moth data in one place and update the *Faunal Checklist of Moths and Butterflies of Vermont*, published in 1995. By pooling entomologists’ and moth-watchers’ personal records and collections with records from the Vermont Atlas of Life on iNaturalist, we’ve compiled the most comprehensive collection of Vermont moth data to date. Whether you’re a dedicated moth-er who stays up late to diligently watch your black light and moth sheet, or a casual naturalist who noticed a Luna Moth that visited your porch light, if you took a photo of a moth and uploaded it to the Vermont Atlas of Life on iNaturalist, you are a valued contributor to the Vermont Moth Atlas.

In 2019, one in five species reported to the Vermont Atlas of Life on iNaturalist were moths—a whopping 1,090 moth species in total! In 2020, more than half that number of species were reported during a single week during the annual Ver-

mont Moth Blitz for National Moth Week, where moth-lovers across the state turned on special lights to find hundreds of moths and other insects gathering on sheets, hunted fields and forests for day-flying moths, and placed rotten fruit bait out to attract other moths.

Currently, the most up-to-date moth checklist for Vermont stands at 1,955 species.

Few have been more critical to the Vermont Moth Atlas than this year’s recipient of the Julie Nicholson Community Science Award, JoAnne Russo. One of the region’s foremost moth experts, JoAnne has helped keep the taxonomy of the Moth Atlas up to date, and never fails to alert us when a new moth for the state is reported and confirmed. Such new discoveries, like the Black-bordered Lemon Moth found during Moth Week, or the impressively large, ominously-named Black Witch, contribute to the more than 400 new species of moths that have been discovered in Vermont since publication of the 1995 faunal checklist.

While some of these new discoveries have been made by moth experts with years of experience, plenty have been made by curious naturalists with a porch light and cell phone camera. Thanks to the availability of field guides like the *Peterson Field Guide to Moths of Northeastern North America*, and the robust artificial intelligence and crowd-sourced identifications on iNaturalist, determining what species of moths are visiting your backyard has never been easier. Currently, the most up-to-date moth checklist for Vermont stands at 1,955 species, and with your help, we’re sure that number will keep going up! **FN**



VCE's new Grassland Ambassadors sign posted on The Mile-Around Woods property in North Bennington.

A Community Pulls Together For Grassland Birds

Conservation partnerships help steward grassland bird management.

| BY KEVIN TOLAN

College campuses aren't generally known to provide prime habitat for rare wildlife species. Bennington College in southern Vermont offers an exception to that rule. For more than a decade, Melissa West and the groundskeeping team at Bennington have stewarded campus greens to provide valuable habitat for the continental U.S.'s fastest declining avian group: ground-nesting grassland birds. The college's long-term focus on grassland bird management—by delaying mowing their fields until the end of July/early August, when the birds have finished nesting—has allowed a small population of Eastern Meadowlarks to persist in harmony with the campus community. In addition to meadowlarks benefiting from this sustained management, local Bobolink densities increased

with field age, in some cases doubling within ten years.

Less than a mile from Bennington College's campus is The Mile-Around Woods, a private preserve managed by The Fund for North Bennington and neighboring landowners. The preserve features a network of walking trails and a 50-acre hayfield. Last year, Becky Manning, who lives adjacent to the field, organized a group of community members concerned with conserving a section of the field for grassland birds. The group was able to strike an agreement with the farmer who hays the field to delay mowing ~20 acres. This past spring, this former grassland bird "population sink" was abuzz with Bobolinks and Savannah Sparrows.

By promoting grassland bird-friendly



The college's long-term focus on grassland bird management—by delaying mowing their fields until the birds have finished nesting—has allowed a small population of Eastern Meadowlarks to persist in harmony with the campus community.

hay practices to provide habitat for species undergoing sharp range-wide declines, Grassland Ambassadors like Becky and Bennington College are helping to keep Bobolinks and Savannah Sparrows, and occasionally the much rarer Eastern Meadowlark, a vital part of Vermont's landscape. With sites set on long-term management, these conserved lands are poised to pay dividends to the birds that nest in their grasses for years to come. In a state where forests dominate the landscape and hay cropping has become increasingly intensive, refuges such as these are ever more important for these highly vulnerable species.

Conservation can happen anywhere, and anyone can be its driving force. VCE's Grassland Ambassadors program works with landowners, farmers, and conservationists, who collectively have helped to conserve hundreds of acres of grassland bird breeding habitat. We aim to strike a balance between the needs of birds and humans by offering technical advice on monitoring and management strategies. To learn more about promoting grassland bird conservation, please email grasslands@vtcostudies.org. **FN**

NEW FACES AT VCE

Community Science Outreach Naturalist

JULIA PUPKO

We are pleased to introduce our new ECO AmeriCorps Community Science Outreach Naturalist, Julia Pupko. Julia's childhood connection with the outdoors near Buffalo, New York inspired her to pursue a degree in Environmental Sciences with a focus on Wildlife Biology at the University of Vermont. Here at VCE, she looks forward to answering your questions about eBird, iNaturalist, eButterfly, and a whole lot more. Welcome, Julia!



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Mountain Ecology Technician

PETE KERBY-MILLER

We are equally pleased to introduce Pete Kerby-Miller as our inaugural ECO AmeriCorps Mountain Ecology Technician. Hailing from Michigan, Pete earned a degree in Environmental Studies and Conservation Biology from Middlebury College. Here at VCE, Pete's work will focus on broadening participation in our mountain ecology programs. Welcome, Pete!



© PETE KERBY-MILLER

Vernal Pools and Grasslands

KEVIN TOLAN

You may remember Kevin Tolan—Maine native, University of Vermont alumnus—who joined VCE last fall as our ECO AmeriCorps member tasked with the split position of Vernal Pool Monitoring Project Coordinator and Grassland Bird Landowner Outreach Technician. Well, Kevin's still with us, but now officially on staff! Kevin will continue his work with the Vernal Pool Monitoring Project and the New England Grassland Ambassadors program, coordinating, training, and assisting volunteers and landowners who wish to become stewards of these unique and vulnerable ecosystems.



© NATHANIEL SHARP

SELECTED PUBLICATIONS

2020

Brlík, Vojtěch, et al. (incl. McFarland, K.P., Rimmer, C.C.)

2020. Weak effects of geolocators on small birds: a meta-analysis controlled for phylogeny and publication bias. *Journal of Animal Ecology* 89(1):207-220 doi.org/10.1111/1365-2656.12962

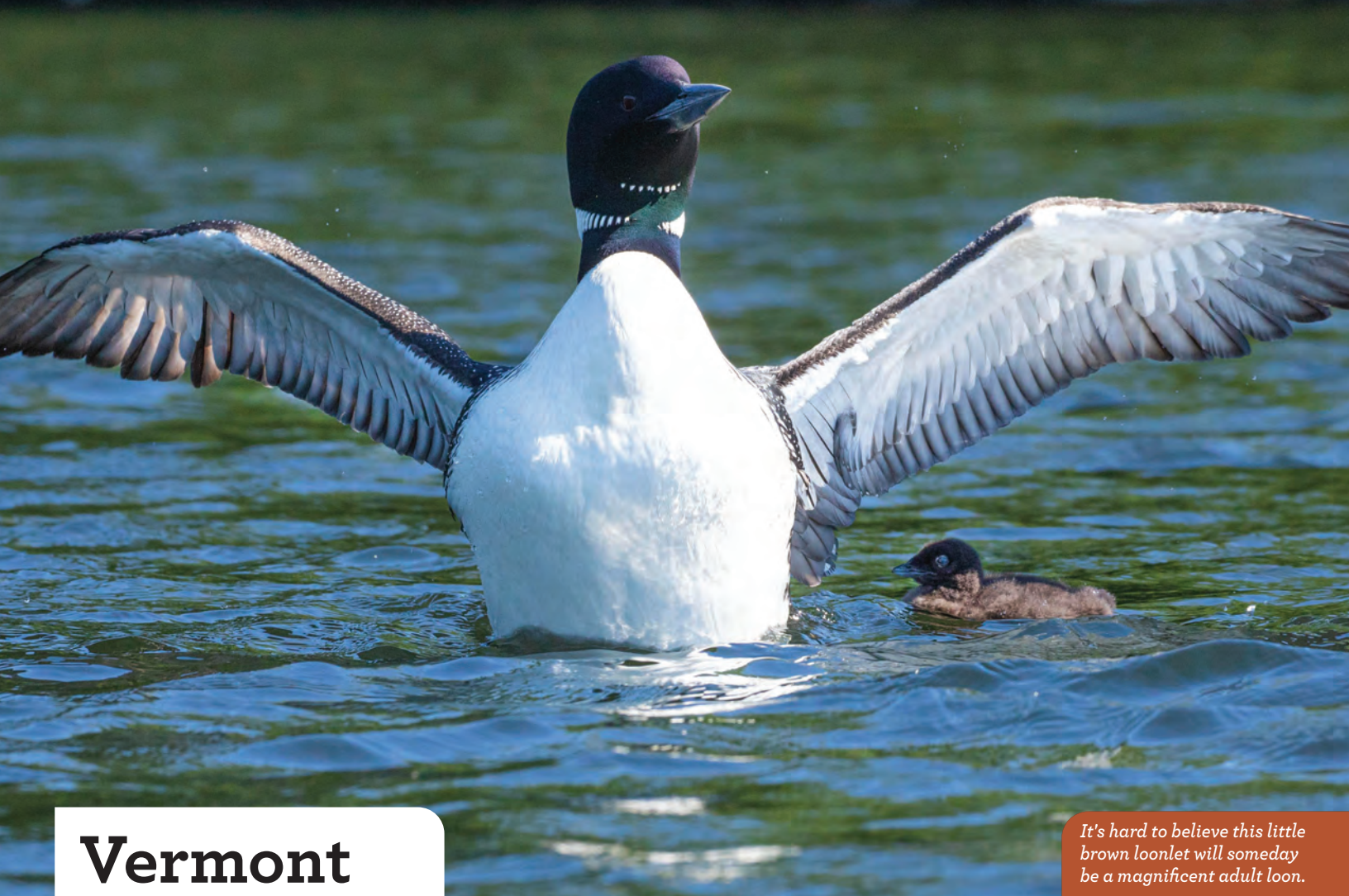
➤ This study explores the effects of attaching tracking devices to different landbird species on apparent survival, condition, phenology, and breeding performance. Authors describe a weak effect on apparent survival of tagged birds, provide recommendations for effect size assessment in future studies, and outline various aspects of tagging that need further investigation.

Rimmer, C.C., J.D. Lloyd, K.P. McFarland, D.C. Evers, and O.P. Lane.

2020. Patterns of blood mercury variation in two long-distance migratory thrushes on Mount Mansfield, Vermont. *Ecotoxicology* 29, 1174–1182 doi.org/10.1007/s10646-019-02104-3

➤ VCE led an investigation into mercury (Hg) blood concentrations in Bicknell's Thrush (*Catharus bicknelli*) and Swainson's Thrush (*C. ustulatus*) from 2000–2017 on Mt. Mansfield, Vermont. No clear temporal trends existed in atmospheric deposition and thrush blood Hg, nor did the study reveal evidence of a relationship between the two. To better evaluate the validity of Bicknell's Thrush as a bioindicator of methylmercury (MeHg) availability in montane forest ecosystems, the study recommends (1) effects-based investigations, (2) a more robust understanding of Hg and MeHg cycling, (3) more research on geospatial and temporal links between Hg deposition and biotic uptake, and (4) more thorough documentation of Hg burdens across the species' annual cycle.

For a complete list of our publications, please visit vtcostudies.org/scientific-publications



Vermont Loons in 2020

Unlike humans, loons had a relatively “normal” year

BY ERIC HANSON

It's hard to believe this little brown loonlet will someday be a magnificent adult loon.

In the midst of a global pandemic, Vermont loons provided some much-needed normalcy in 2020. VCE was fortunate that our loon field season could proceed much like any other summer's. While in-person volunteer interactions were greatly reduced and outreach programs restricted to webinars, VCE and our community loon enthusiasts still managed to fix nesting rafts and put out nest warning signs during an unusually busy boater season. Loons responded with another strong nesting performance.

Loon productivity in 2020 was slightly lower than last year's record-breaking tally of 101 nests. Of the 95 pairs that attempted nesting, 65 successfully hatched 102 eggs, with 75 chicks surviving through August. Vermont's chick survival rate of 74%, or 0.56 chicks surviving per territorial pair, continues to eclipse average chick productivity in North America, which falls around 0.52 surviving chicks per territorial pair. Competition for a limited number of available nest sites, predation from eagles, and interference from “intruder” loons are slowing Vermont's rate of population growth—a natural process as we edge closer to carrying capacity. Regardless, it can be hard to be objective when “your” loons are not successful.

This year's drop in productivity can be explained by fewer nesting attempts and lower success rates. Thirty-three pairs “took the year off,” possibly due to marginal available habitat, late-season mate-switches, or low water levels. Dam repairs necessitated lowering water levels on two reservoirs: Sugar Hill Reservoir was reduced to



© PAUL HOLMES

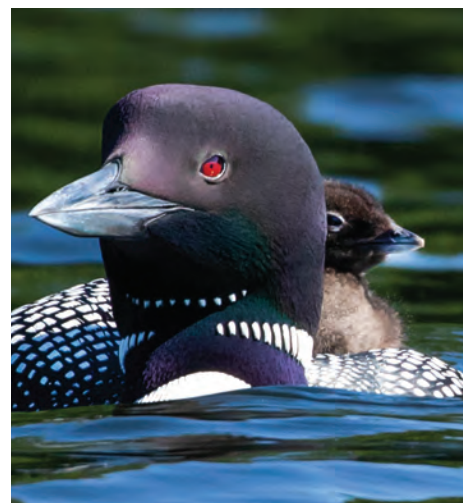
one-third its normal size, and low water levels on Molly's Falls Reservoir marooned two nesting rafts on shore. They were too heavy to move through one-foot deep muck, so we built two new ones in a hurry—and good thing we did, because both rafts were occupied and three chicks made it through the summer. Predation, mostly by mammals, seems to be the number-one cause of nest failure, but eagles and ravens are also likely culprits. Further, territorial disputes can take a toll on breeding success. The Lowell Lake pair bred twice and lost all four chicks for the second year in a row—three after territorial disputes, and one to unknown causes.

Thankfully, we had only one rescue attempt this summer. An adult entangled in fishing line was first reported on Colby Pond in late June, then subsequently observed on nearby Lake Rescue and Amherst Lake. Its normal behavior suggested that the line was not interfering with diving, eating, preening, or flying. As a precaution, volunteer Charles Davis and I drove down to assess the bird's condition. We surveyed Amherst, Echo, and Colby lakes—and found all devoid of loons. We arrived at Lake Rescue to find photographer Christian Lagenhocher quietly watching a loon pair through a big lens. I paddled up to ask

if he could see any fishing line; he said “Yes,” and that he was looking up (on his phone) who to contact. I raised my hand. Another volunteer and photographer, Nancy Nutile-McMenemy, saw the loon again in late August on Amherst Lake with a single strand of line in its mouth. We expect that this loon was likely able to migrate to the coast.

One unusual twist in an otherwise typical season was that six loon pairs initiated nests in late June or early July, resulting in several late July hatches. Three of these late nests were on Somerset Reservoir, which is the only Vermont reservoir required by its license to hold water levels steady for loon nests. It can be really tricky to balance minimum flow requirements and maintain water levels during a drought year. The engineers and staff at Great River Hydro (GRH) once again did an outstanding job to ensure success for the loons. Henry Dandeneau, Nicki Steel, and Jane MacKugler conducted many extra surveys at hatch time so we could update GRH promptly.

We could not possibly complete all our sign buoy and raft work, respond to distress calls, and monitor both nests and loons without the incredible devotion of hundreds of volunteers. Thank you once again for another great year. **FN**



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2020 VERMONT COMMON LOON STATS

358
ADULTS

134
TERRITORIAL
PAIRS

95
NEST
ATTEMPTS

65
SUCCESSFUL
NESTS

4
RE-NESTS

1
SUCCESSFUL
RE-NEST

42
NESTING RAFTS
DEPLOYED

34 RAFTS USED
(74% successful)

31 ISLAND NESTS
(74% successful)

23 MARSH NESTS
(70% successful)

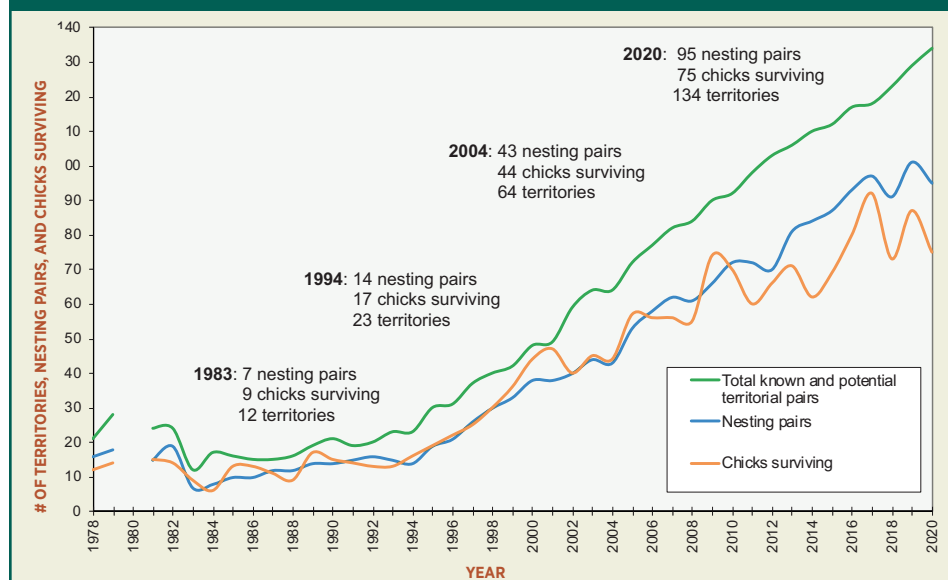
7 SHORELINE NESTS
(14% successful)
**50 NESTS WITH
WARNING SIGNS**

102
CHICKS
HATCHED

75
CHICKS
SURVIVED
THROUGH
AUGUST
(74% successful)

3
NEW NESTING
PAIRS

VERMONT LOONS: BREEDING ACTIVITY 1978-2020





© GERRY BIRON

JoAnne Russo

A lifetime dedicated to nature.

“My parents bought me my first field guide, and I used my grandmother’s opera glasses to identify the birds I was seeing,” JoAnne recalls as an early memory of watching birds at the feeders of her family home in Winsted, Connecticut. She also remembers, on numerous occasions, hearing a commotion at the feeders and witnessing hordes of Evening Grosbeaks devouring sunflower seeds. “Their bright yellow plumage certainly lit up the winter days.”

As a child, JoAnne was fascinated with nature and liked to collect beetles, but they weren’t allowed in the house—dead or alive! She entered college at the University of New Hampshire as a wildlife management major, but graduated with a fine arts degree. Nature inspired her artwork then, and still does today.

JoAnne and her husband, Gerry Biron, moved to Rockingham, Vermont in 1993. Fall, winter, and spring seasons were devoted to exploring the area and finding new birds. “I started entering my lists in eBird in 2006 and continue to this day,” said JoAnne. Summers needed to be filled with some outdoor distraction since birding was slow, and JoAnne found herself seduced by moths. “I decided to survey all the moth species that were attracted to the lights at my house. In the end, I counted almost 1,000 different species.” She joined iNaturalist in 2012, and has since recorded 1,068 moth species in Vermont and helped identify almost 26,000 entries for other iNaturalist moth observers. JoAnne noted, “I am so happy that Kent McFarland has put so much time and effort into getting our Vermont Moth Atlas off the ground.”

JoAnne remarked that when she found herself wrapped up in moths, she discovered how important community scientists are to broaden knowledge of insect, bird, and wildlife populations across the state. Southern Vermont was woefully under-reported for moth species, since most surveys have been conducted elsewhere in the state. “I have also given moth presentations to many nature groups around Vermont and hopefully have encouraged more community scientists!”

Beyond her amazing work with moths, JoAnne teamed with Vermont Master Gardener and naturalist Alma Beals in the first year of the Hemlock Woolly Adelgid survey in southeastern Vermont, and she and Gerry participated in VCE’s Vermont

Bumble Bee Atlas survey in 2012/2013. In 2019, JoAnne joined Trish Hanson (retired Vermont Forest Health Entomologist) in curating the state’s insect collection, now housed at the Vermont Agriculture & Environmental Laboratory. And last (but not least), JoAnne continues to serve as an official counter at the annual Putney Mountain Hawkwatch raptor count. Data collected there are part of the Raptor Population Index, a database of raptor population trends in the Northeast. Official counters submit their data to eBird and the Hawk Migration Association of North America (HMANA).

JoAnne Russo’s contributions to better understanding the conservation status of Vermont’s wildlife (especially moths) have been extraordinary—and for this, the staff and board of VCE are proud to present JoAnne with the 2020 Julie Nicholson Community Scientist Award. **FN**

The Julie Nicholson Community Science Award honors Julie Nicholson’s extraordinary passion and commitment to birds and wildlife conservation through her many years of tireless work as a community scientist. It is presented annually to an individual who exemplifies Julie’s dedication to the cause of community science and conservation.



© SAGE LUKSEVISH

Jason Crooks

Unwavering commitment to mountain birds.

To further recognize the accomplishments and dedication of volunteers who contribute to our science and conservation work, VCE has created a new annual award—VCE Community Scientist of the Year. We are pleased to present the inaugural 2020 award to Jason Crooks, Mountain Birdwatch community scientist extraordinaire!

VCE biologist Jason Hill, who oversees the Mountain Birdwatch (MBW) program, offers the following tribute in honor of Jason Crooks' unwavering commitment to the program, especially in the face of a global pandemic.

M BW community scientists go above and beyond, typically contributing 30 hours of their time each June to the project. MBW surveys start before dawn, so observers customarily hike in the night before and camp overnight. Our 2020 season, however, had a wrench thrown into the works by the COVID-19 pandemic. In June, many trails (e.g., the Long and Appalachian Trails) and management units (e.g., Mansfield State Forest) were still closed to all overnight camping. Backcountry shelters and lean-tos are often required for overnight stays in the mountains, and the risk of virus transmission was just too high. Needless to say, these restric-



➤ *Bicknell's Thrush*

© CHARLES GANGAS

tions—appropriate and logical as they were—greatly complicated MBW surveying efforts.

Although MBW participation fell to its lowest level since we started keeping track in 2001, one observer still managed to safely and compliantly survey three routes. If you didn't encounter him during your day hike this past June, you'd be forgiven—you'd have needed infrared goggles and a much earlier start to see Jason Crooks hiking up a couple of his routes at 3 a.m. Four hours later, Jason was on his way back down before most hikers had hit the trail.

This dedication is far from new for Jason; he has annually surveyed multiple MBW routes since 2007, and he currently surveys a route on Worcester Mountain (elevation 3293') and two routes on Mt. Mansfield (4393') with his stepson Sage. Jason also conducts annual surveys through our Forest Bird Monitoring Program, and he monitors a falcon nest up on Nebraska Notch on Mt. Mansfield as part of Audubon Vermont's Peregrine Falcon Recovery Project.

Jason seeks solace in nature from his home base of 12 acres in Westford, Vermont, with his wife, Michaela, whom he met during Peace Corps operations in Africa. Jason and Michaela strive to be good stewards of their land to ensure that all pieces of the ecosystem remain intact—when they're not paddling, digging in their big garden, or tending to their bee hives.

When asked why he participates in MBW, Jason replied, "I love being out in the woods. Why not spend time there not only enjoying, but gathering data for valuable long-term studies? I look forward to spring each year, partly because I know I'll be sitting quietly on a mountainside listening for my avian friends to return."

On behalf of VCE and the birds, thank you Jason, and congratulations. **FN**



© K.P. MCFARLAND



© K.P. MCFARLAND

Pruinose Squash Bee

The diminutive native Pruinose Squash Bee is an important pollinator for the cucurbit family of plants (e.g., squash, cucumber, watermelon, and pumpkin). This bee's entire life cycle revolves around squash flowers: in the morning when flowers are open, females collect pollen and deposit their bounty in underground nests nearby, and in the afternoon males rest inside the closed flowers. VCE volunteers have helped find and document this species across Vermont.

Quillwort (*Isoetes viridimontana*) was discovered by amateur Vermont botanist Michael Rosenthal, and it is only known from a single mountain lakeshore. The Green Mountain Maidenhair Fern (*Adiantum viridimontanum*), a specialist of serpentine soil, was first described in 1991 by Dr. Cathy Paris in the northern Green Mountains.

In 1842 Zadock Thompson wrote, "...but of the great majority of insects scarcely anything is known either good or evil." This still rings true today. I once asked the late Dr. Ross Bell, a revered entomologist at the University of Vermont, how many invertebrate species he thought might exist in Vermont. After a few minutes of literally scribbling and figuring on the back of an envelope, he responded, "21,400... but who really knows?"

As human activity profoundly alters the map of life on local and global scales, our knowledge of plant and animal distributions across the landscape and over long periods of time gains greater urgency. We can't respond effectively to climate change, natural disasters, invasive species, and other environmental and economic threats without a deep understanding of the

natural world around us.

From our inception, VCE has been a leader in identifying and mapping Vermont's biodiversity. Enlisting a legion of "community naturalists" to support our efforts, we have spearheaded groundbreaking atlas projects on breeding birds, butterflies, bumble bees, and vernal pools. Yet, these worthy efforts represent a mere fraction of the state's natural heritage. For many biological groups there exists no reliable assessment of their distribution, abundance, or population trends. VCE's solution to this information gap was to create the Vermont Atlas of Life (VAL). With more than 5.3 million occurrence records representing nearly 10,500 species, and growing, VAL has quickly become the central library of knowledge on Vermont's biodiversity, with open access for all.

TACKLING A NEW FRONTIER: BEE DIVERSITY

The Vermont Atlas of Life recently launched its most ambitious biodiversity project yet: the Vermont Wild Bee Survey (VTBees). Although previous estimates suggested that over 300 species of wild bees inhabit Vermont,

no one had ever conducted a statewide survey to verify this number. VTBees represents the first step toward comprehensive bee conservation in the state.

Joined by the Vermont Fish & Wildlife Department, Stone Environmental, and more than 90 dedicated volunteer naturalists, in 2019 we amassed an impressive collection of over 10,000 wild bee observations from the shorelines of Lake Champlain to the alpine summit of Mount Mansfield. Even with this bounty of bee records from 2019, many survey sites and new species remained to be discovered in 2020.

However, like so many other aspects of life, our VTBees project fell prey to operational impacts from the coronavirus pandemic. Unable to enlist the help of our small army of community scientists for the 2020 field season, VCE biologist and VTBees coordinator Spencer Hardy traversed the state like a solitary bee himself, as he surveyed backyards, gardens, and rare plant communities, discovering a new bee species for the state every week or two along the way. Spencer's efforts yielded at least a dozen new native species, including one previously unrecorded in the eastern U.S. We also documented two new introduced bees, Taurus Mason Bee (*Osmia taurus*) from Europe and Viper's Bugloss Small-Mason (*Hoplitis anthocopoides*) from southeast Asia—the first one found in New England. What effect, if any, these bees will have on native populations is not known.

Spencer didn't have to go far from home to make new bee discoveries. Visiting a Montpelier backyard, he turned up Vermont's first record of the Constrained Cuckoo Carder Bee (*Stelis coarctatus*). This species is a nest parasite of resin bees (*Heriades*), which nest in old beetle holes in dead wood. By leaving a pile of logs and brush in their backyard, the homeowners may have unintentionally created perfect habitat for both of these native bees.

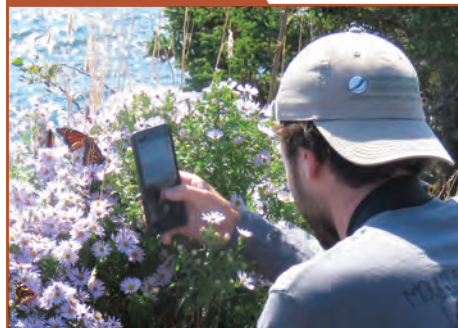
Spencer even found rare bees in his own garden. For the past few years he's planted tomatillos and ground-cherries, because both plants are visited by a number of specialist bees (and have great-tasting fruit). At least two of these specialists showed up in Spencer's garden, including the first state record for a sweat bee that is rare enough to have no common name, *Lasioglossum pectinatum*. "How widespread these species are in Vermont remains an open question; one that can be tackled by making a lot of salsa verde," says Spencer.

Each day of field surveys necessitates several days of painstaking lab work, poring over specimens through a microscope. Identifying each bee to species can be extremely tricky. Thankfully, several experts are helping VCE work through our thousands of specimens. We're also cataloging and identifying over 10,000 historic bee specimens from public and private collections; these will enable us to peer back in time and examine trends for certain species.

In addition to bees collected during field surveys, volunteers seeking solace in the outdoors during the pandemic added a record number of bee observations to the Vermont Atlas of Life on iNaturalist this past season. Over 500 observers added nearly 5,000 bee records from across the state in 2020. Thanks to identifications from world experts like Dr. John Ascher, 79 species were verified from photographs alone, including the Sunflower Burrowing-Resin Bee (*Paranthidium jugatorium*), discovered and photographed by Kevin Hemeon around Bennington, Vermont.

We now estimate that there are over 350 wild bee species in Vermont. With our knowledge of wild bees and their conservation in Vermont still in its infancy, the information we garner over the next few years will serve as a guide for research and conservation strategies for these amazing insects far into the Anthropocene. **FN**

COMMUNITY SCIENCE OPPORTUNITIES



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 each year, volunteers visit and collect data to monitor "adopted" vernal pools following protocols and using 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

FIELD NOTES

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Polished Lady Beetle (*Cycloneda munda*)



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Polished Lady Beetles are one of 33 historically documented native lady beetle species occurring in Vermont.

| BY JULIA PUPKO

Upon slowly peeling my net open, I jumped as a grasshopper and several honey bees zoomed out. Sweep netting (walking transects while thwacking vegetation with a net, then inspecting the contents) was going to take some getting used to. A glimmer of orange caught my eye, and excitement replaced contemplations on the odds of a grasshopper lodging itself in my nostril: I had caught a lady beetle!

The beetle in question was a Polished Lady Beetle (*Cycloneda munda*), one of 33 historically documented native lady beetle species occurring in Vermont. The wing covers are a solid light red to orange color—one of only three species in the U.S. devoid of spots. The pronotum (behind the head) is black, with a white pattern resembling drawn-on antennae or a fancy letter “M.”

This particular species can grow to 6.2 mm

in length and spends its days snacking on aphids and insect larvae in habitats ranging from agricultural fields to forests and shrubby fields. Based on a Michigan study, *C. munda* seems to prefer deciduous and brushy habitat, although the species will also utilize crops such as alfalfa and corn. The tiny *C. munda* I found was definitely in prime habitat—a small, overgrown field surrounded by forest, with scattered dogwood, buckthorn, eastern redcedars, and numerous goldenrods.

The Polished Lady Beetle has shown indications of sensitivity to non-native lady beetle populations. This may be caused by a few factors: established non-native lady beetle species usually grow faster and become larger than *C. munda*, allowing them to outcompete *C. munda* for food; further, some non-native species are predatory on *C. munda* eggs and larvae. A 23-year study noted that *C. munda* populations declined sharply following the introduction of two non-native species in different years, with the local *C. munda* population dropping to half its original size in the first years following the introduction of *Harmonia axyridis* (Multi-colored Asian Lady Beetle).

Sadly, the Polished Lady Beetle is not alone in its susceptibility to introduced lady beetle competitors. This, combined with habitat loss and widespread use of pesticides, has led to sharp declines of many native species.

Hope is not lost! Through projects such as VCE's Vermont Lady Beetle Atlas, we can learn more about our native species and how to best support them before they vanish. **FN**