

Field Notes

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

Monitoring Mercury:

From mountain vistas to vernal pools, VCE studies reveal this industrial toxin is more entangled in the food web than previously thought. | BY EMILY ANDERSON

Be careful which fish you eat. Those who fish Vermont's waterways are likely familiar with the signs and pamphlets detailing which fish are safe and which might contain unacceptably high levels of mercury, an environmental toxin that can cause central nervous system damage. For decades, scientists saw atmospheric mercury deposition—often originating from coal-fired power plants or other industrial processes—as a problem that exclusively plagued water bodies. These ecosystems offer the perfect conditions for benign inorganic mercury to transform into toxic methylmercury, which can impair and sicken those who ingest it regularly. Predators are most likely to suffer, due to mercury's tendency to accumulate as it travels up the food web. Scientists have spent years studying its harmful effects in Common Loons, Bald Eagles, and other fish-eating animals that regularly consume contaminated prey. *(continued on page 10)*



Belvidere Mountain

IN THIS ISSUE

Grasslands Ambassadors | [page 3](#)

2019 Julie Nicholson Citizen Scientist Award | [page 6](#)

2019 Loon Update | [page 8](#)

FIELD NOTES

Fall 2019 • Volume 12, No. 2

EXECUTIVE DIRECTOR

Chris Rimmer

ASSOCIATE DIRECTOR

Susan Hindinger

DIRECTOR OF COMMUNICATIONS

Karen Bourque

CONSERVATION BIOLOGISTS

Steve Faccio

Eric Hanson

Jason Hill

Kent McFarland

OUTREACH NATURALIST

Sara Zahendra

BUSINESS MANAGER

Mistie Boule

DEVELOPMENT COORDINATOR

Sarah Carline

SOFTWARE DEVELOPER

Jason Loomis

DATA TECHNICIAN

Nathaniel Sharp

ECO AMERICORPS MEMBERS

Emily Anderson, Kevin Tolan

BOARD OF DIRECTORS

Peter Brooke, Chair

Margaret Cheney,

Nan Cochran, Bill Hayes,

Bob Holley, Jared Keyes,

Chris Rimmer, William Schmidt

TUCK/REVERS NONPROFIT

BOARD FELLOW

Charlie Carey

DESIGN

Wendy McMillan

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 citizen 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.

VERMONT CENTER FOR ECOSTUDIES

PO Box 420

Norwich, VT 05055

(802) 649-1431



Printed on recycled paper

Field Notes is made possible by a generous gift from Jeff and Terry Marshall.

VCE VIEW



© SUSAN HINDINGER

Birds have made the news of late, for all the wrong reasons. First, a ground-breaking, peer-reviewed article in *Science* documented stunning, widespread declines in North America's avifauna, including many formerly abundant and familiar species. A mere two weeks later, National Audubon issued a sobering report

that forecasts how a warming climate is expected to impact our continent's birds by the end of this century.

Both publications point to an unfolding ecological collapse that may be driving recent avian declines, and propelling them further downward. It is difficult to come away with less than a grim outlook. However, all of us committed to conservation—of whatever taxa, habitats, or landscapes—have no choice but to view these reports as a call to action. The *Science* paper highlights a number of species whose populations have increased, mostly via human intervention, while the Audubon report emphasizes that lower emission scenarios—which are still achievable with concerted, immediate action—could greatly reduce extinction risks for up to 75% of North American birds. All is not lost, if we act swiftly.

While none of us can downplay the damage done, or the grave risks our migrant and resident birds face, the choices are clear. We must move our conservation agenda forward—aggressively and decisively—and motivate our fellow citizens to join the fray. And, we must do so not only with utmost seriousness of purpose, and with decisions based on science, but with a sense of joy and hopefulness.

Joy, one might ask?? In the face of overwhelming, demoralizing odds? Yes, absolutely. We can not let “eco-anxiety” take over, immobilizing us, creating a downward spiral of passivity. Humans have won many environmental battles over the years, often in response to crises. Joy and passion for the natural world are our allies, our most effective arms.

I'm reading Michael McCarthy's *The Moth Snowstorm*, a moving essay about the insect apocalypse (before that term found its way into the ecological lexicon), and I've been struck by his reflections on joy: “There can be occasions when we suddenly and involuntarily find ourselves loving the natural world with a startling intensity, in a burst of emotion which we may not fully understand, and the only word that seems to me to be appropriate for this feeling is joy... a sudden passionate happiness which the natural world can trigger in us, and which may well be the most serious business of all.”

As scientists, conservationists, and global citizens, we all need to find that joy, to embrace it, share it, and perpetuate it. We can't—and VCE won't—ignore the challenges or shirk from seeking solutions. But, we must all ensure that joy and courage motivate us, not fear or pessimism. Despair and resignation are not options. Spend time outdoors—alone and with others—savor the birds and their wild places, believe in Earth's resilience. Pay attention, and act. There is time, though it's fleeting. **FN**

Chris Rimmer
EXECUTIVE DIRECTOR

Participants at a workshop co-run by VCE in Amherst, NH learn how to survey grassland birds in the field.



© LIZA MORSE

Grassland Ambassadors

Conserving Our Cultural and Ecological Heritage. | BY LIZA MORSE

Squinting, binoculars in hand, we scan the field for movement. Soon our efforts are rewarded with an explosion of flight as a male Bobolink emerges from the grass, circling his domain with a bubbly R2-D2-like song. The female proves more elusive, but soon she emerges from the grass, and, not to be overlooked, a male Savannah Sparrow sings out with a buzzy *tsip-tsip-tsip-tsee-srrr*. It is late May in St. Johnsbury, and a group of local landowners, or Grassland Ambassadors as we call them, have gathered at the property of Karen Bufka to learn about managing for and monitoring the birds on their own land.

Like many grassland landowners in Vermont, Karen relies on a local farmer to hay her field. Thankfully, this year Karen and her farmer were able to delay mowing until after the Bobolink nesting period. But as the number of Vermont farmers declines, haying—delayed or otherwise—may become increasingly difficult. Vermont's farming population is aging; a 2002 report from the Vermont Council on Rural Development found that the average age of principal operators of Vermont farms was 54, up from 49 in 1978. The study also found that the percentage of Vermont farmers whose principal occupation was farming had decreased 20% between 1974 and 2002. With mounting economic challenges facing farmers, younger Vermonters may be prevented from entering the profession or taking on the family farm, likely exacerbating this trend away from farming.

You may wonder why a wildlife conservation organization should be concerned about agricultural decline. It comes down to the inexorable link between

human land use and grassland birds. In an otherwise forested state, Bobolinks and Savannah Sparrows—the target species of VCE's Grassland Ambassadors program—exist on the landscape largely as a result of agricultural activities that maintain open grasslands.

In the face of a declining agricultural economy and plummeting grassland bird populations worldwide, conservation of grassland birds in Vermont represents a welcome opportunity to conserve both our cultural and ecological heritage. By working with farmers and owners of grassland habitats to find a pragmatic balance between human and avian needs, VCE's Grassland Ambassadors program aims to do just that. Thanks to these farmers and landowners who go on to champion the conservation of grassland birds in their own communities, our outreach initiates—as Karen Bufka put it—“a powerful ripple effect.” Start a ripple effect in your community by contacting us at grasslands@vtecostudies.org. ^{FN}

Alexander Dickey
Conservation
Intern Rose West
admires a banded
Bicknell's Thrush
before releasing it
back to the wild.



©MICHAEL SARGENT

Rooted in Vermont

Conservation Internship Affirms a Sense of Place. | BY ROSE WEST

THE ALEXANDER
DICKEY
CONSERVATION
INTERNSHIP
ALLOWED ME
TO RECONNECT.
ALMOST EVERY
DAY I WAS
REMINDING WHY
I AM
PASSIONATE ABOUT
THE NATURAL
WORLD AND
CONSERVATION.

Scrolling through photos I've taken over the past twelve weeks offers a glimpse of the moments I was lucky to immortalize. The first one is an odd image: a large, white goose egg, found cold on the first loon raft I visited on Little Averill Lake after a 45-minute canoe paddle in the brisk, windy weather of early spring. I recall being entranced by its size and simplicity. I also recall returning weeks later and finding the remnants of its white shell after the organism within re-entered the local ecosystem, likely via an opportunistic predator.

The privilege of being VCE's 2019 Alexander Dickey Conservation Intern has been my own pathway back into Vermont's natural world and beyond; in a way, enabling me to "re-enter" its unique environmental mosaic. Growing up locally, I feel like I have been raised by Vermont's woods, waters, and bountiful biodiversity. So many of the places I traveled during my internship were deeply familiar to me; I smile at my photo of a gnarly, unfurling wood fern taken on a Mountain Birdwatch route on Glastenbury Mountain—only a few miles from my childhood

home. To my delight, many other places were completely novel, such as the high-elevation spruce-fir forests, where the krummholz, stunted and twisted by harsh weather conditions, always left me in awe. Immersing myself in the conservation projects VCE spearheads was as deeply fulfilling as the landscapes in which I found myself. Through my efforts to keenly watch and listen, record, search, and rebuild, I felt I was able to give back to the environment.

The internship also allowed me to reconnect. Almost every day I was reminded why I am passionate about the natural world and conservation, not only through the interactions I had with the biotic and abiotic, but with people who share my care and concern. One photo I hold dear, taken atop Vermont's highest peak, is of me and Alexander Dickey's thoughtful mother, together releasing a newly-banded juvenile White-throated Sparrow, both sharing a moment of unreserved wonder. Moments of inspiration were plentiful during my frequent travels, whether from explaining the "teacher, teacher, teacher" song of an Ovenbird to a fellow hiker, getting assistance from a group of botanists thrilled by the large array of native plants I had carefully balanced on my paddle-board to vegetate a loon nesting raft, or from the collective effort of volunteers who worked together to keep careful watch over an injured loon. All the while, the staff at VCE mentored me with their wide array of ecological knowledge and technical skills, fueling my personal and professional development.

Marking the end of my first hands-on experience in insect-bitten, sweat-dripping conservation work, this brings me to the last photo I have from this field-frenzied summer—taken by bemused onlookers, unbeknownst to me—of myself, standing atop my paddle board balancing more vegetation, two goose guards, and a dirty shovel. The photo captures my season of growth and my deep-rooted sense of certainty that I've found my place moving forward in a conservation-focused career. **FN**

STAFF UPDATES



Rosalind Renfrew

Fond Farewell to a VCE Founder.

Anyone who knows Rosalind Renfrew—a VCE founder, topflight ornithologist, and international leader in grassland bird conservation science—has undoubtedly sensed her passion and commitment not only to wildlife, but to people. Her caring nature and spirited approach to life have infused her work as scientist, colleague, and mentor throughout her 12 years with VCE.

Now, Roz has redirected her talents and compassion as she embarks on a “working sabbatical” of sorts from the arena of wildlife ecology and conservation. In a serendipitous turn of events, she was recruited to lead a group tasked with tackling an issue unrelated to the natural world: human trafficking. In August, Roz bid adieu to VCE to serve as the Human Trafficking Task Force Coordinator for the Vermont Center for Crime Victim Services.

Roz shared, “While my heart remains firmly with wildlife conservation, I’m taking this fork in the road with the hopes of one day returning to the world of conservation, equipped to contribute in new and more impactful ways.” She will remain involved in bird research on her own time, and happily, as part of the VCE family via our Advisory Council. While we will miss our daily collaborations (and lively conversations around the lunch table), we wish our friend Roz nothing but the best in her new career path. Her legacy at VCE runs deep, and her contributions to bird conservation, from Vermont to Bolivia and Argentina, inspire us all. **FN**

NEW FACES AT VCE

Citizen Science Outreach Naturalist

We are pleased to introduce our new ECO Americorps Citizen Science Outreach Naturalist, Emily Anderson. Emily is a native Vermonter and life-long nature enthusiast whose experience in the environmental field ranges from research to education to policy. She looks forward to answering your questions about eBird, iNaturalist, e-Butterfly, and a whole lot more. Welcome Emily!



Vernal Pools and Grasslands: Two Hats, One Coordinator

Kevin Tolan—Maine native, University of Vermont alumnus, and ECO Americorps member—has stepped into the split position of Vernal Pool Monitoring Project Coordinator and Grassland Bird Landowner Outreach Technician. An avid birder with a passion for conservation, Kevin will grow the community of landowners and volunteers who work with VCE to protect these unique and threatened ecosystems.



VCE's First Data Technician

And finally, we are pleased to announce that Nathaniel Sharp, our previous ECO AmeriCorps Citizen Science Outreach Naturalist, has joined VCE's staff as our first-ever Data Technician! Nathaniel will be organizing and managing big-data projects such as the Vermont Atlas of Life, VCE's long-term bird-banding operation, and other citizen-science databases. While he'll no longer be on the front lines to answer your natural history questions, you'll still find him birding throughout Vermont or identifying observations on iNaturalist.



Sue Wetmore with an overly-friendly Florida Scrub Jay.



Sue Wetmore

A lifetime of birding passion and service. | BY CHRIS RIMMER

In the realm of Vermont birding and bird conservation, no one radiates more enthusiasm and pitches in with more energy than Susanne (Sue) Wetmore. From reviewing rarity reports on the Vermont Bird Records Committee, to confirming nesting gnatcatchers and wrens on both of Vermont's Breeding Bird Atlases, to counting Whip-poor-wills under moonlit skies, Sue has done it all. Selecting her as our 2019 Julie Nicholson Citizen Scientist was a hands-down decision for all of us at VCE.

In Sue's own words: "I grew up in Rhode Island and came to Vermont in 1960, as a teenager. Spending time outdoors with my dad—hunting, fishing, and observing nature—kindled a love for being out in the natural world. My deeper interest in birding and conservation started as an adult, when I innocently put up a bird feeder one winter to entertain our two young sons. Birds that were familiar, and some that weren't, quickly piqued my interest. I soon bought a field guide, then binoculars."

As a longtime resident of Brandon, Sue joins fellow Rutland County residents Roy Pilcher (2009) and Marv and Sue Elliott (2014), plus nearby Bennington resident Ruth Stewart (2010), in the pantheon of Julie Nicholson Citizen Science awardees from southwestern Vermont. In fact, her birding trajectory received a transformative early boost from Roy Pilcher himself. As Sue recounts, "One day I saw an ad in the local newspaper offering a 7:00 am bird walk with Roy Pilcher. I dutifully appeared—the only person to show up—and said 'I guess you won't be doing the walk now.' Well, Roy being Roy, he of course exclaimed, 'Oh yes, we will.' That first encounter with an expert birder (and teacher) completely hooked me. As they say, the rest is history."

That history now spans more than four decades as a birder, citizen scientist, naturalist-teacher, and conservation advocate. Sue recently retired after 38 years as a volunteer coordinator and classroom presenter at Neshobe School in Brandon,

first for the ELF Nature Program, then for Four Winds Nature Institute. She has been closely involved with Rutland County Audubon for nearly as long as she's been birding and is an active board member. Her numerous citizen science immersions include hands-on field work on both the first (1976–1981) and second (2003–2007) Atlas of Breeding Birds of Vermont, running a USGS Breeding Bird Survey route, conducting surveys for shrubland birds in power line right-of-ways, censusing loons on three ponds for VCE's annual mid-summer Loonwatch, and surveying at all hours of the night for Eastern Whip-poor-wills. Add to those her dedication to eBird (a devoted user since 2005, with 2,625 checklists in Rutland County alone!) and iNaturalist, and her participation as a member of the Vermont Bird Records Committee—it's hard to imagine Sue's days leave any hours for "normal" activities!

Sue and her husband George have adopted a migratory lifestyle in recent years. They now overwinter, with Bachman's Sparrows and Florida Scrub Jays, in Christmas, Florida, where Sue turns her exuberance to the birds and natural history of a different landscape. In addition to spending time with their 4 year-old granddaughter (they also have a 15 year-old, 6'5" football-playing grandson in Hinesburg, Vermont with a fondness for loons), Sue and George love to explore in their mobile camper, birding and photographing as they go. Sue is hardly slowing down—life offers far too many opportunities for that. Her energy and outgoing personality are embodied in these words: "While a passion for birds opened my eyes to the need to protect all of Vermont's flora and fauna, by far, the greatest reward of being a birder is meeting people and sharing field experiences." Congratulations, Sue, and thanks from all of us for sharing your passion so enthusiastically! **FN**

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



A VCE Visit

From left: Jason Hill, Eric Hanson, Karen Bourque, Melina González, Yolanda León, Chris Rimmer, Jason Loomis, Sarah Carline.

© ROD GRIFFIN

VCE Dominican Conservation Partners venture from Hispaniola to Vermont. | BY YOLANDA LEÓN

This past August, VCE had the distinct privilege of hosting longtime conservation colleague Dr. Yolanda León and her student Melina González, from our Dominican Republic partner institutions Grupo Jaragua (a Dominican non-profit dedicated to preserving Hispaniola's biodiversity) and Instituto Tecnológico de Santo Domingo (INTEC). Our visitors spent three non-stop days with VCE staff learning about our citizen science projects, and Yolanda presented a brown bag seminar on our collaborative work in Sierra de Bahoruco. She and Chris Rimmer then attended a three-day meeting of the International Bicknell's Thrush Conservation Group in Quebec City. Yolanda kindly wrote the following summary of her and Melina's Vermont experience, and of our collaborative on-the-ground conservation efforts in Sierra de Bahoruco.

The primary goal of my INTEC student Melina's and my visit to Vermont was to meet with VCE staff involved in conservation projects that use citizen scientists. We are currently trying to promote citizen science in the Dominican Republic as a way to engage the public in conservation, and also to boost biodiversity databases and data sharing in the DR. We learned enough to make our heads spin from VCE's long experience on public engagement strategies, data collection protocols for volunteers, and database design and publishing—that knowledge will be invaluable for our work! This training visit and our efforts to launch a citizen science initiative in the DR were made possible by Grupo Jaragua's partnership with VCE under the PEER (Partnerships

for Enhanced Engagement in Research) program, jointly funded by USAID and the National Academy of Sciences.

I was pleased to present a public lecture at VCE on the chronic conservation crisis in Sierra de Bahoruco National Park, where Grupo Jaragua and VCE are jointly executing a three-year project to restore and preserve forests that are important wintering habitats for Bicknell's Thrush, as well as many other migrants and Hispaniolan endemic birds, plus an impressive array of other biodiversity (especially plants, insects, and amphibians). For the past six years, Grupo Jaragua, VCE and other partners have worked hard—with very limited success—to make the national environmental authority, the Ministry of the Environment, enforce the

DR's protected areas law. We realized it was time to try new tactics. Building on Grupo Jaragua's extensive knowledge of the local people, culture, and agriculture systems, which are root causes of the park's deforestation, we are now piloting a new strategy to engage with local land holders, resulting in better outcomes both for them and Bahoruco's highly threatened montane forests. We selected a project site known as Las Abejas, on the southeastern side of the national park, where Bicknell's Thrush occupy winter territories at ~1200 m elevation in thick, wet broadleaf forests. Our project is funded by Environment and Climate Change Canada, and we are very excited by this opportunity to try out a new means to achieve conservation, one involving and respecting local landholders who inhabited the area long before creation of the park. We expect that this project's initial phase will result in natural restoration and conservation of approximately 100 hectares of some of the Caribbean's most extensive and diverse montane forests. That may seem like a very small step in a protected area that covers nearly 113,000 hectares, but we believe our approach holds great promise for locally-based, sustainable conservation. **FN**



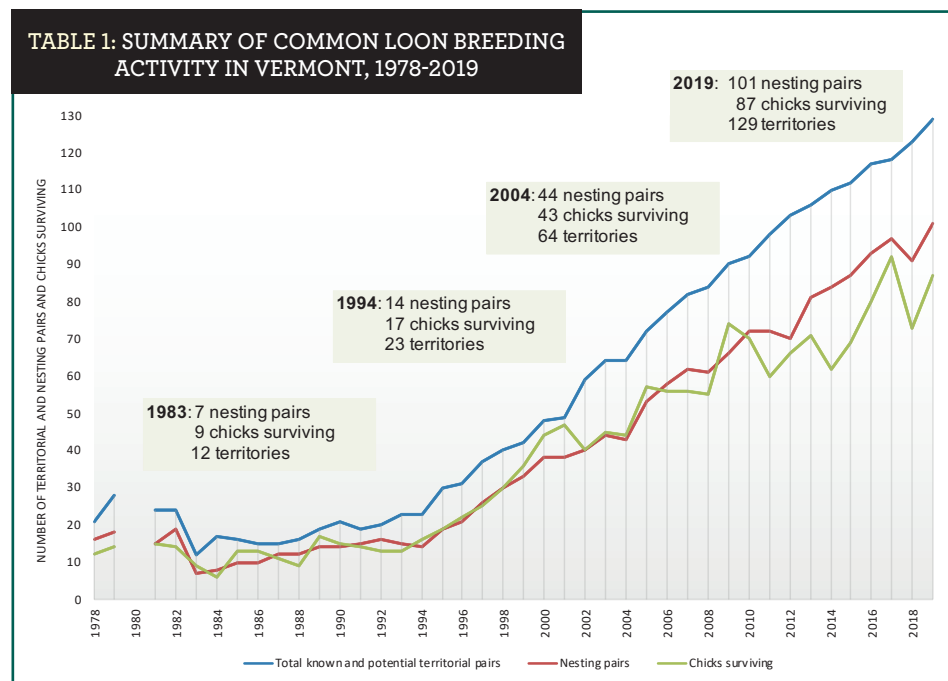
A Historic Year for Nesting Loons

Another record-setting year for the Vermont Loon Conservation Project.

BY ERIC HANSON

The Vermont Loon Conservation Project achieved a historic milestone in 2019. For the first time since loon monitoring began in 1978, we recorded 100 nesting pairs statewide—101 to be exact! Our early summer surveys had led us to believe that we'd again fall short of the century mark, but on July 20 (during VCE's annual Loonwatch Day) a chick was reported on Flagg Pond. That report was both surprising and important because we had effectively written off Flagg Pond, as the loon pair observed there in mid-June did not appear to be nesting. Happily, the birds gave it a go, resulting in the long-awaited 100th Vermont nest.

TABLE 1: SUMMARY OF COMMON LOON BREEDING ACTIVITY IN VERMONT, 1978-2019



Imagine our surprise when, a month later, a chick was reported on May Pond—where several May-July nesting surveys had come up empty—confirming nest #101. These two discoveries illustrate the importance of conducting our annual count in July and of enlisting roaming volunteers to

WE RECORDED THE HIGHEST-EVER NUMBER OF LOON CHICKS LOST TO ADULT INTRUDERS, BUT OVERALL CHICK SURVIVORSHIP EXCEEDED THE PAST FIVE-YEAR'S AVERAGE.

report loon sightings throughout the entire summer. They also highlight the healthy dose of humility that loons regularly bestow on us humans.

In 2019, we recorded the highest-ever number of chicks lost to intruder loons and territorial fights (9), but overall chick survivorship (76%) actually exceeded the past five-year's average (73%). This summer we received many reports of Bald Eagles swooping down on loon families, but most of these were all show (although witnesses did report two loon chicks taken by eagles). Despite increased numbers of "single" loons seeking territories and Bald Eagles searching for food, Vermont's loon chicks appear to be faring well.

As shown in the sidebar to the right, 13 of the 43 nesting rafts deployed were not used by loons. Four pairs that could have taken advantage of our human-made accommodations chose instead to nest in natural locations, and nine pairs simply took a "year off" from nesting. This summer saw a record number of flooded nests (13), with seven failing after the June 19 deluge that soaked Vermont with up to five inches of rain.

Unfortunately, seven adult loons died of unknown causes in 2019; all were delivered to Tufts University for necrop-

sies. We monitored five loons entangled in fishing gear, and Tim Carey, a Vermont Fish & Wildlife Department game warden, rescued and released one of them on Lake Ninevah. We found healthy loons during follow-up surveys of the other four entanglements, thus are hopeful that at least a few birds were able to free themselves from the line/lure.

All of us at VCE are sincerely grateful to our 300-plus volunteers for their dedicated hands-on help, to Vermont game wardens for checking on loons in trouble, to hydro-electric dam operators for preventing nests from flooding, and to everyone else who contributed in myriad ways to make possible this record-breaking season for Vermont's loons. **FN**

Vermont Common Loons in 2019

➤ Territorial pairs:	129
➤ Nest Attempts:	101
➤ Successful Nests:	75
(includes re-nests)	
➤ Re-nests:	10
➤ Successful re-nests:	8
➤ New nesting pairs:	5
➤ Chicks hatched out:	115
➤ Chicks surviving through August: (76%)	87
➤ Flooded nests:	13
➤ Known depredated nests:	6
➤ Intruder loon-caused nest failures:	2
➤ # of rafts deployed:	43
➤ # rafts used:	30
(90% successful)	
➤ # island nests:	34
(79% successful)	
➤ # marsh nests:	29
(66% successful)	
➤ # shoreline nests:	8
(25% successful)	
➤ # nests with warning signs:	50
➤ Total # signs placed:	239
➤ Loonwatch count	339 adults

CITIZEN SCIENCE OPPORTUNITIES

© SUSAN HINDINGER



You don't need a background in science to be a Citizen 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 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

MONITORING MERCURY

continued from page 1

Despite concerns about the effects of environmental mercury contamination, few people looked much beyond the water's edge. Through monitoring atmospheric mercury deposition in the 1990s, however, scientists with the Vermont Monitoring Cooperative (now the Forest Ecosystem Monitoring Cooperative) discovered that higher terrestrial elevations in the Northeast often receive the most mercury.

"When they unveiled a map of mercury deposition hotspots, we immediately recognized that it closely mirrored Bicknell's Thrush mountain forest breeding habitat," notes VCE's Kent McFarland. "But was this mercury entering the food web as benign inorganic mercury or methylmercury, which might be unhealthy for Bicknell's Thrush and other montane animals? That was something we wanted to know."

Intrigued, VCE biologists contacted Dave Evers, a colleague with the Biodiversity Research Institute who specialized in mercury contamination in wildlife. With his help and encouragement, they began collecting blood samples from Bicknell's Thrush and other songbirds on Mt. Mansfield and beyond.

"Fortunately the process is simple and harmless. When the birds are captured for banding, we use a very small needle to draw a few drops of blood from a vein under the wing, and then off they fly," said Chris Rimmer.

What they found challenged perceptions of mercury cycling and uptake in the terrestrial environment. Mercury—almost entirely in its toxic form—was present in all Bicknell's Thrushes sampled. A few years later, another study led by VCE provided evidence that mercury biomagnifies (increases in concentration) as it moves up the montane food web, as it does in aquatic ecosystems. Interestingly, they found that blood mercury concentrations in Bicknell's Thrush fluctuated throughout the year. Samples taken on the species' wintering grounds



Dartmouth researcher, Vivien Taylor, collects a water sample for mercury analysis at a vernal pool in Pomfret.

© KATE BUCKMAN

**FROM VCE'S STUDIES
THUS FAR, WE KNOW THAT
MERCURY IS FAR MORE
PERVASIVE IN NORTH-
EASTERN TERRESTRIAL
ECOSYSTEMS THAN
ORIGINALLY ASSUMED.**



© STEVE FACCIO

Spotted Salamander

in Hispaniola showed relatively higher blood mercury levels, which birds carried north during spring migration. When they arrived on the breeding grounds, blood mercury levels rose even higher for a few weeks, and then slowly decreased during the summer as thrushes switched from consuming mercury-rich spiders and ground beetles found high in the food web to caterpillars and other foliage-eating insects.

Armed with past results and now nearly two decades of mercury data, VCE biologists were eager to see whether recent reductions in mercury emissions in the Northeast were reflected in lower uptake by the birds. They were startled by the results.

"Not only did we find no significant change in blood mercury levels in the sampled birds, we saw no evidence that atmospheric deposition on Mt. Mansfield

had changed. Furthermore, we found no correlation between the levels of mercury deposited on the mountain and the amount that accumulates in thrushes," Chris explained. This could only mean one thing: that the processes governing how mercury behaves in the environment are more complicated than anyone thought.

Mountains are not the only overlooked environment where mercury hides. "We suspected that vernal pools were ideal systems to convert inorganic mercury into methylmercury, and there was very little about it in the literature," VCE's Steve Faccio explained. Steve, along with collaborators from Dartmouth College, believed that this represented a significant gap in our understanding of mercury and potential threats to vernal pool-dependent species. They also felt that it was important to establish baseline data now in order to see how mercury concentrations may change in the future. By analyzing mercury levels in Spotted Salamanders, Wood Frogs, and a suite of invertebrates, the team confirmed that vernal pools do create the perfect environment for mercury to methylate and enter the aquatic food web. Once there, methylmercury bioaccumulates, and rapidly builds to high levels in salamander larvae and predatory beetles. From these findings, the team concluded that vernal pool amphibians and invertebrates could provide an important pathway for mercury to enter the surrounding terrestrial environment.

In response to decades of evidence demonstrating mercury's impact on people and the environment, the U.S. government has enacted regulations that require emitters to attain specific emission standards set by the EPA. Although these standards hold great promise for reducing pollution and health concerns associated with mercury, many critics fear even more hurdles for the struggling coal industry. As a self-proclaimed champion of coal, the current administration has set its sights on dismantling many environmental regulations, including those reducing mercury emissions. Although attempts have fallen short thus far, those concerned about mercury deposition worry that removing too many regulations could cause levels to increase.

Despite efforts to suppress mercury regulations in the U.S., a global mercury-reduction initiative still exists. Many concerned parties, including the U.S. during the Obama administration, signed the Minamata Convention on Mercury—the first-ever agreement focused on reducing heavy metal pollution. Through projects including phasing-out of existing mercury mines and placing control measures on air emissions, the parties hope to reduce mercury pollution worldwide. The convention has met twice since 2017 and will meet again in November of 2019 to continue developing strategies for monitoring mercury contamination, such as establishing a biomonitoring system.

From VCE's studies thus far, we know that mercury is far more pervasive in Northeastern terrestrial ecosystems than originally assumed. However, there is still much we don't know, such as how inorganic mercury is converted to methylmercury in terrestrial ecosystems, what long-term consequences it may have, and how long it persists after the offending emissions have been reduced. What we also know is that in this era of climate change, acid deposition, and other challenges to biodiversity, it is imperative to continue monitoring native flora and fauna to help us make better management and policy decisions in the future. **FN**



2019

- Rimmer, C.C., J.D. Lloyd, K.P. McFarland, D.C. Evers, and P.L. Oksana.** 2019. Patterns of blood mercury variation in two long-distance migratory thrushes on Mount Mansfield, Vermont. *Ecotoxicology*. <https://doi.org/10.1007/s10646-019-02104-3>
- Faccio, S.D., K.L. Buckman, J.D. Lloyd, A.N. Curtis, and V.F. Taylor.** 2019. Bioaccumulation of methylmercury in wood frogs and spotted salamanders in Vermont vernal pools. *Ecotoxicology* 28: 717-731. <https://doi.org/10.1007/s10646-019-02068-4>.
- Lloyd J.D., C.C. Rimmer, and J.A. Salguero-Farías.** 2019. Short-term effects of hurricanes Maria and Irma on forest birds of Puerto Rico. *PLoS ONE* 14(6): e0214432. <https://doi.org/10.1371/journal.pone.0214432>
- Rimmer, C. C., J.D. Lloyd, and J.A. Salguero Farías.** 2019. Overwintering Bicknell's Thrush (*Catharus bicknelli*) on Puerto Rico—rare and local. *Journal of Caribbean Ornithology* 32:34-38.
- Rodenhouse, N.L., W. H. Lowe, R.L.E. Gebauer, K. P. McFarland, and M.S. Bank.** 2019. Mercury bioaccumulation in temperate forest food webs associated with headwater streams. *Science of The Total Environment* 665: 125-1134. <https://doi.org/10.1016/j.scitotenv.2019.02.151>
- Faccio, S.D., S.W. MacFaden, and E.W. Buford.** 2019. Where do Salamanders Cross the Road? Development of a GIS Model to Identify Amphibian Road-crossing Hotspots: Final report submitted to the Vermont Agency of Transportation. 19pp. doi: <https://doi.org/10.6084/m9.figshare.7754930.v1>
- Hill, J. M. and R. B. Renfrew.** 2019. Migratory patterns and connectivity of two North American grassland bird species. *Ecology and Evolution* 9:680-692. doi: <https://doi.org/10.1002/ece3.4795>
- Brlík, Vojtěch, et al. (incl. K.P. McFarland and C.C. Rimmer)** 2019. Weak effects of geolocators on small birds: a meta-analysis controlled for phylogeny and publication bias. *Journal of Animal Ecology*. <https://doi.org/10.1111/1365-2656.12962>

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

Have you bought your Vermont Fish & Wildlife Department Habitat Stamp yet?

In Vermont, the natural world is core to our way of life, and funds generated from the sale of this stamp are one way to perpetuate our natural legacy. Your Habitat Stamp purchase helps keep rivers clean, woods connected, and meadowlands open. Your donation also leverages federal dollars for wildlife habitat conservation. Support wildlife and public land conservation by visiting <https://vtfishandwildlife.com/vthabitatstamp> to get your stamp today!



FIELD NOTES

VERMONT CENTER FOR ECOSTUDIES
PO BOX 420
NORWICH, VT 05055

NON-PROFIT ORG
U. S. POSTAGE
PAID
WHT RIV JCT, VT
PERMIT No. 73

Eastern Whip-poor-will {*Antrostomus vociferus*}



© DOUG SCOBEL

A sleepy Whip-poor-will
lets out a wide yawn.

A Beguiling Bird That Sings its Name.

| BY SARAH CARLINE

The eerie chant of the Eastern Whip-poor-will was once heard throughout the Northeast, its distinctive call a welcome harbinger of spring. Becoming active after sunset, these crepuscular hunters fly silently into open areas in search of aerial insects, with more than half their diet consisting of moths. During summer when the moon is at least half full, their onomatopoeic “*whip-poor-will*” call is easily recognized, from as far as a half-mile away.

Why are Whip-poor-wills so unique?

- They time their egg-laying so chicks hatch ~10 days before a full moon, enabling moonlit foraging in order to catch enough insects to feed their nestlings.
- Whip-poor-will eggs, chicks, and adults are so well camouflaged against leaf litter that it is difficult for predators (and bird watchers!) to spot them during the day.
- Whip-poor-wills have large eyes and a reflective layer behind their retinas called the “tapetum lucidum,” which allows more light to reach their photoreceptors and causes their eyes to reflect brightly when hit with a light. Their eyes are laterally placed, allowing a wide visual field.
- Bristly whiskers around the bill face forward

and may help funnel insects into their mouth, as well as protect their eyes.

- Their genus name is *Antrostomus*, from the latin *Antro* meaning “cavern” and *stomus* meaning “mouth.” Whip-poor-wills have a tiny bill that opens up to a huge, gaping mouth, allowing them to scoop up large insects whole.
- Their species name is *vociferus*. Males can chant their name seemingly endlessly for hours at dusk, dawn, or throughout moonlit nights. One observer actually counted 1,088 “*whip-poor-will*” phrases repeated without a break!

Many of the Whip-poor-will’s former haunts have grown quiet over the last 50 years. Partners in Flight estimates that about two out of three Whip-poor-wills have been lost since 1970. During the first Vermont Breeding Bird Atlas (1976-1981), the species was found in 30 survey blocks, but it was recorded in only seven of those blocks during the second atlas (2003-2007). Similar declines have been reported throughout the Northeast.

In response to these dramatic losses, the Eastern Whip-poor-will was listed as Threatened in Vermont in 2011. What caused such declines? Scientists suspect multiple factors from habitat loss due to forest maturation or development; predation from cats, raccoons, and other predators; or a decline in moth populations from pesticides and introduced parasitoids used to control forest pests.

To gain a more precise estimate of the species’ Vermont distribution and population size, VCE has conducted surveys in cooperation with the Vermont Fish & Wildlife Department for the past six years. We’re hopeful that with targeted management and monitoring, Eastern Whip-poor-will populations can rebound, and decades from now we’ll still hear them singing under the full moons of summer. **FN**