

Field Notes

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

United Nations Convenes on Biological Diversity

As the UN decides the fate of global biodiversity conservation, VCE fills critical knowledge gaps. | BY VAL STAFF

With Earth's sixth mass extinction already underway, governments from around the world will meet in Montréal this December to agree on new global goals to protect and restore nature. The outcome will dictate the fate of biodiversity and guide conservation action worldwide for the next 20 years. Joining a global network of biodiversity data providers, VCE's Vermont Atlas of Life (VAL) project is contributing biodiversity data to support these efforts.

In 1992, The Convention on Biological Diversity (CBD) first recognized in international law that biodiversity conservation is "a common concern of humankind." All UN member states have adopted this treaty except the United States, which has signed but failed to ratify it.

The CBD meetings, called Conferences of the Parties (COP), are numbered. COP-10 produced the Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets. The upcoming meeting, COP-15 (also known as the post-2020 global biodiversity framework), will hopefully end with an agreed-upon framework to drive global actions to protect and restore biodiversity.

The current draft framework sets *(continued on page 8)*

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FIELD NOTES

Fall 2022 • Volume 15, No. 2

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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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FOR ECOSTUDIES

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VCE VIEW



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Countless times in the last decade, Chris Rimmer has focused his spotting scope on a bird and then stepped aside, inviting me to have a look. He would rarely identify the bird, waiting for me to make my own observations, ask questions, and offer my best guess. And he took almost as much delight in my progress as a birder as I did.

I've picked up more than just birding tips from Chris over our nine years spent working together. As I step into the Executive Director role at VCE, I'm reflecting on the leadership values he embodied as its founding ED. Some of these values have helped to define VCE's identity as a community organization and a place of work:

- Relationships are central to everything we do.
- Our pursuit of excellence applies to science and communications.
- Optimism is infectious and inspiring.
- Family comes first.

I think we have these tenets, respectively, to thank for our loyal and ever-growing family of volunteers and supporters, for the exceptional quality of VCE's scholarship and outreach, for determination and persistence in the face of environmental challenges, and for the

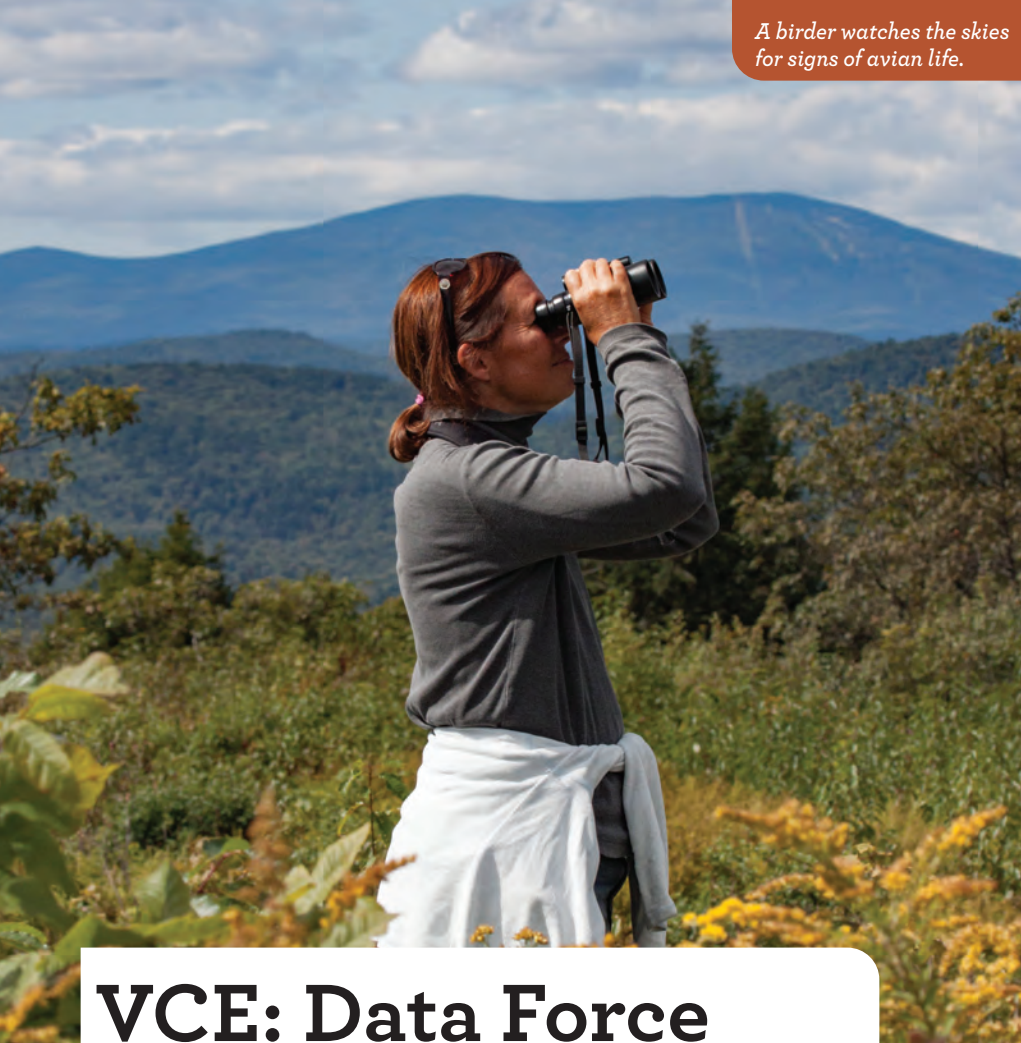
health and well-being of our talented and dedicated staff.

While I consider matters of leadership, we as a staff are discussing core values and our vision for VCE's future. How best do we continue to evolve, and deepen our impact, without compromising the qualities of the organization that matter most to us? How close are we to that sweet spot: large enough to work efficiently and tackle big conservation problems, yet small enough to be nimble and tight knit? What are the best parts of the compact start-up that marked VCE's early years that we should be sure to retain as it matures?

With our bold strategic plan to guide us, intentional conversations to reassert our core values, and a legion of dedicated supporters and community scientists, VCE has a winning formula. As its leader, I will nurture what is already a terrific team of creative and curious professionals and work hard to garner the resources that will allow them to realize our aspirations for wildlife conservation. Please join us as we step into the next, exciting stage in the life of this dynamic organization.

Susan Hindinger
EXECUTIVE DIRECTOR

A birder watches the skies for signs of avian life.



© KENT MCFARLAND

VCE: Data Force Multiplier

Cooperative science supports conservation outcomes in Vermont and beyond. | BY JASON HILL

salmon aquaculture to insect extinctions and Arctic animal migrations.

But did you know that VCE biologists personally contribute thousands of observations and checklists to a suite of community science programs each year? From Christmas Bird Counts to eButterfly, we routinely volunteer our time and expertise to review and identify your community science observations on platforms like iNaturalist and eBird. We also help recruit observers and coordinate regional efforts for continental programs like the North American Breeding Bird Survey.

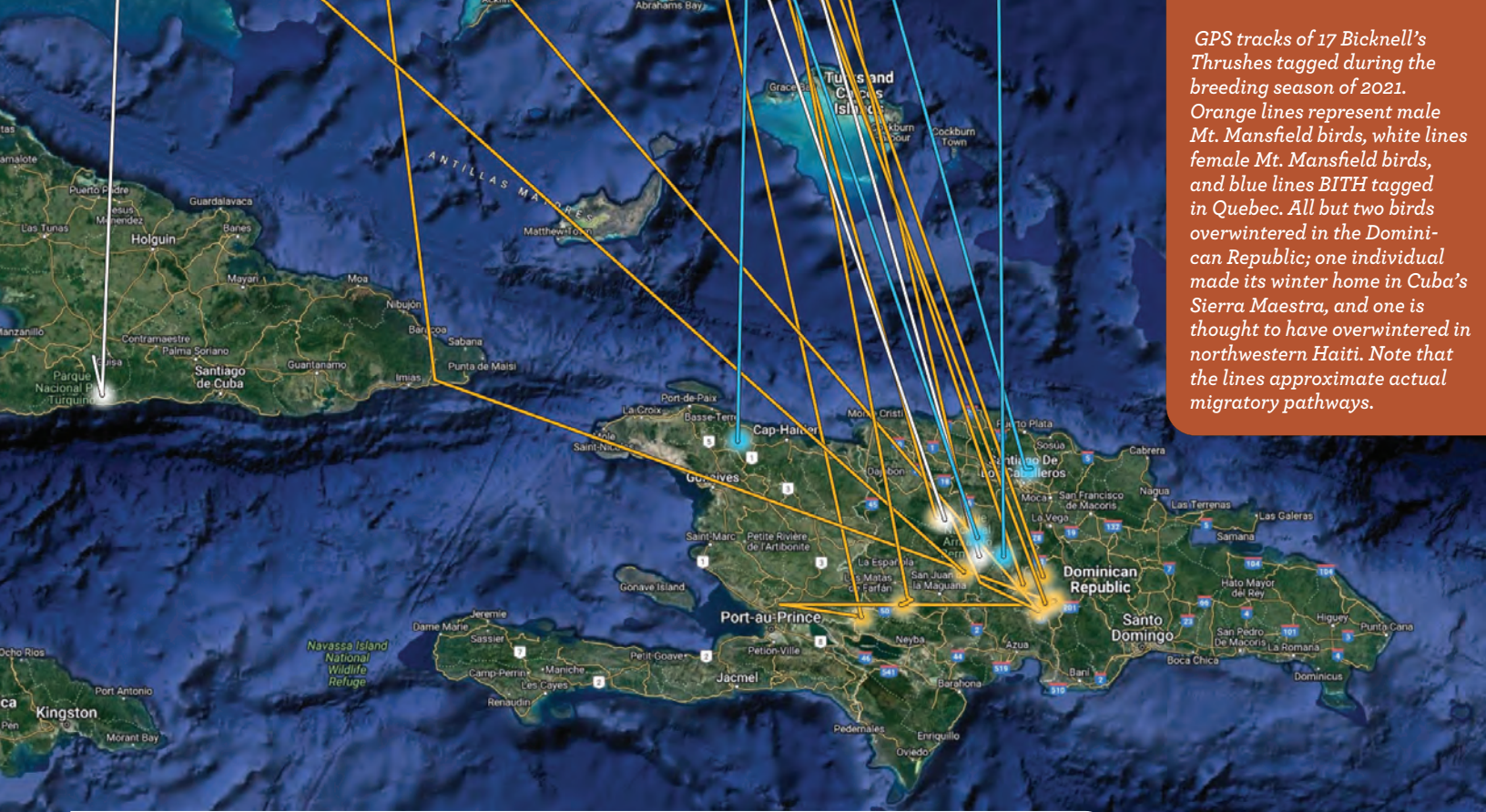
VCE biologists even purposefully design and tailor our research methods to benefit scientific efforts outside of VCE. When we need to count Common Loons or bumble bees for our own research, we often choose methods that will not only serve our needs but simultaneously contribute to external projects. That's why VCE's LoonWatch uses the same monitoring protocols as many other North American loon monitoring projects—to facilitate continent-wide trend analyses. Likewise, we input our milkweed counts from VCE's Pollinators on Powerlines project into the annual Mission Monarch community science program. Mountain Birdwatch has also contributed almost 40,000 checklists of montane bird species from remote locations to eBird. Teegan Docherty, a Coordinating Scientist with the Boreal Avian Monitoring Project (BAM), perhaps best summed up the value of VCE's data leverage after obtaining data from our Forest Bird Monitoring Program: "We greatly appreciate [VCE's] contribution to the BAM database...[These data] fill a regional gap in our database and have allowed us to expand analyses into northern US regions and [southern Canada]."

Increasing dataset availability, embracing Open Data standards, and thoughtfully contributing our own data to other research initiatives is our vision of cooperative science—it has the power to help all of us obtain desired conservation outcomes more quickly and efficiently. **FN**

VCE is a data powerhouse—collating and repackaging smaller datasets from a vast array of sources and intentionally leveraging our own data to benefit science initiatives outside our organization.

If you're familiar with VCE, then you already know that no program leverages data better than the Vermont Atlas of Life (VAL), which currently curates 7.8 million records spanning more than 22,000 species across the state. Photos of centuries-old museum records, records rescued from dusty desk drawers and private collections, and research survey results from professional biologists may all be queried by anyone with a web browser through the VAL Data Explorer. So far, more than 70 groups of scientists have used these invaluable Vermont datasets in their research on topics ranging from offshore

Increasing dataset availability, embracing Open Data standards, and thoughtfully contributing our own data to other research initiatives is our vision of cooperative science.



GPS tracks of 17 Bicknell's Thrushes tagged during the breeding season of 2021. Orange lines represent male Mt. Mansfield birds, white lines female Mt. Mansfield birds, and blue lines BITH tagged in Quebec. All but two birds overwintered in the Dominican Republic; one individual made its winter home in Cuba's Sierra Maestra, and one is thought to have overwintered in northwestern Haiti. Note that the lines approximate actual migratory pathways.

Tracking Bicknell's Thrushes Across the Hemisphere

© CHARLES GANGAS



Backpack-toting BITH offer insights into overwintering birds' whereabouts.

BY CHRIS RIMMER

After a suspenseful winter during which VCE biologists apprehensively brooded over the fate of 50 Bicknell's Thrushes fitted last summer with miniature GPS tags, male #2821-79231 prompted a whoop of joy on the Mt. Mansfield ridgeline at 8:45 pm this past 31 May. The bird's historic mist net recovery brought elation and relief to us banders. Banded as a yearling on 6 July 2021 and fitted with GPS tag #50463, the returnee was in robust condition, weighing in at 28.8 g. We snipped off his GPS backpack, gingerly replaced it with a new one, and sent him on his way. VCE Staff Biologist Kevin Tolan immediately connected the tag to his laptop and confirmed that the unit had recorded >50 GPS "fixes" (precise locations that we had programmed in advance).

After closing nets at noon the following day, we were nearly giddy, having retrieved another four backpacks. Year two of our three-year study had

begun with a flourish—six weeks later, eight additional Mansfield birds had furnished their precious tags. Meanwhile, our Canadian colleague Yves Aubry retrieved another four tags from the 14 males he had tagged in Quebec. This recovery rate of 34% exceeded our nervous expectations!

Preliminary data from 17 birds (14 males, 3 females) provide unprecedented insights into BITH's precise non-breeding season movements and locations. The overall pattern confirms that overwintering birds are highly concentrated in the Dominican Republic; 15 settled there, while one male overwintered in northern Haiti and a female in eastern Cuba's Sierra Maestra. Further, it appears that the mid- to late-winter intratropical migrations we suspected did not occur. Only four birds (three males and the Cuba female) showed notable movements from their discrete early winter territories, and

NEW FACES AT VCE

Preliminary data from 17 birds provide unprecedented insights into BITH's precise non-breeding season movements and locations.

three of these didn't move until late April or early May, at which point their GPS batteries died. These were likely pre-migratory dispersals.

One female deserves special mention: #2821-79107 behaved like most of the other 16 BITH we tracked. She overwintered in the Dominican Republic's Cordillera Central, approximately 4 km east of the island's (and the Caribbean's) highest peak, Pico Duarte (3,087 m). She was among the most sedentary of the birds we tracked, having settled on her winter territory by 1 November and remained at least until 3 May, when her GPS battery died. She also claimed honors as the highest-altitude BITH ever documented on the planet; her winter territory of 6+ months occupied a patch of cloud forest between 2,460 and 2,665 m in elevation!

Research excitement aside, we've gained a newfound respect for backpack-toting BITH. Consider female #2821-79107: she spent four months in Mansfield's fir forests to raise a brood, underwent her energy-intensive annual molt, prepared for and then navigated the arduous southward migration, inhabited a patch of Dominican cloud forest at an altitude of 2,500 m for six months, then winged her way back north to the very same patch of Vermont montane forest to begin the cycle again!

We eagerly await our 2023 field season, when we fully expect to intercept several of the 20 BITH we tagged this summer, 11 of them birds who returned their 2021 backpacks. It will be fascinating to compare individual movements between years. **FN**



ALEXANDRA JOHNSON

Communications Assistant

This summer, our communications team welcomed Alex Johnson as VCE's first-ever Communications Assistant. Alex completed her bachelor's degree in conservation biology at SUNY-ESF and spent several years afterward assisting with field research across the U.S. She is currently finishing a master's degree in journalism at Boston University. Alex's passion for sharing the process of ecology with a broad audience is already boosting VCE's social media presence and helping us develop long-term communications plans. We can't wait to see what she contributes next!



DESIREE NARANGO

Conservation Biologist

We are pleased to introduce our newest Conservation Biologist, Desiree Narango. Desiree joined us after completing the David H. Smith Conservation Research Fellowship at the University of Massachusetts Amherst, where she studied habitat quality and species interactions of migratory birds and insects in urban forests. She received her Ph.D. in Entomology and Wildlife Ecology from the University of Delaware where she investigated the impacts of nonnative plants on food webs. Desiree brings a holistic, interdisciplinary approach to applied ecological research and a robust science communication record. Desiree is a tremendous addition to our team, and we couldn't be happier to welcome her aboard!



DAN LAMBERT

Associate Director

Last but certainly not least, we are pleased to welcome Dan Lambert to VCE's leadership team as Associate Director. Dan's educational background (MS in ecology and environmental biology from the University of Alberta and BA in environmental education from Dartmouth College) led to a 20+ year career in ornithology, conservation science, conservation planning, and education. Dan previously held positions at American Bird Conservancy, the Vermont Institute of Natural Science, and High Branch Conservation Services. In 2001, he expanded the Vermont Forest Bird Monitoring Program's high-elevation survey routes into one of VCE's flagship programs, Mountain Birdwatch. His most recent post was at the Center for Northern Woodlands Education, where he served as the associate director. Please join us in welcoming Dan to our team! **FN**



A loon flies over Long Pond in Benton, NH.

Diving Deeper Into Loon Health

Investigating causes of mortality will help Vermont's loons remain a success story.

BY ERIC HANSON



© PAUL HOLMES

Vermont's loon population is still going strong! Over the past three years, VCE biologists and volunteers have recorded more than 100 nest attempts each breeding season. However, our loons' current success doesn't guarantee continued recovery, due, in part, to persistent toxic and pathogenic threats. In 2022, our loon conservation team ramped up efforts to investigate causes of mortality while maintaining our bread-and-butter statewide monitoring programs. This newer angle will not only better inform management within our Vermont Loon Conservation Program, but it will also contribute valuable data to numerous loon monitoring projects across North America. Now, let's dive into our two main strategies for understanding loon population health and causes of mortality.

This year, our team continued conducting necropsies. These procedures are crucial to understanding causes of mortality because—unlike other methods—they allow us to determine a precise cause of death. Without necropsies, we would likely never know that threats such as lead poisoning, aspergillosis, and malaria are rising. For example, at least seven loons have died from lead fishing gear since 2019 (a three-fold increase compared to the previous 10 years). Vermont has also lost at least 14 loons to aspergillosis since 2007—a remarkable growth given that only two were known to have died from this fungal infection between 1989 and 2006. And finally, malaria has emerged as a new cause of mortality, killing at least six loons across the Northeast in the past decade.

In 2022, our loon conservation team ramped up efforts to investigate causes of mortality.

Performing necropsies is not a new study approach for VCE loon biologists. We conducted our first necropsies in 2020 in collaboration with Bren Lundborg at the Vermont Institute of Natural Science and Dr. Mark Pokras, professor emeritus at Tufts University. Since then, we have necropsied 23 loons. This summer, first-year Tufts vet student and VCE seasonal biologist Karli Fletcher helped us assess four loons during a “necropsy day” in her parents’ garage. We noted fishing gear ingestion as the cause of death in three loons; we’re still waiting to find out whether the consumed tackle was lead-based. The fourth loon died from aspergillosis infection.

In addition to necropsies, we also collected blood and feather samples from two live loons this summer (vtcostudies.org/blog/banding-loons-by-night). Sampling live loons to assess mercury, malaria, and aspergillosis helps us understand overall population health. You may notice lead missing from that list. Researchers typically don’t test for lead levels in healthy loons. Instead, we measure mercury to evaluate how this neurotoxin accumulates in waterbodies and guide policies that control emissions. We plan to continue gathering samples annually and expand our banded loon population for long-term demographic studies.

Looking forward, I’m incredibly excited to pursue a deeper understanding of Vermont’s loons’ health and mortality. By contributing our data to continent-wide studies, VCE can help ensure that the Common Loon’s recovery continues. We look forward to sharing results as we analyze our data. **FN**



A newly built raft is moved towards the shoreline by VCE’s loon conservation team and volunteers.

© LI SHEN

**2022
VERMONT
COMMON
LOON STATS**

112
**CHICKS
HATCHED OUT**
*(77% chicks
surviving)*

139
**TERRITORIAL
PAIRS**

86
**CHICKS
SURVIVED
THROUGH
AUGUST**

105
**NESTING
PAIRS**

9
**NESTING RAFTS
PLACED**

6
**NEW NESTING
PAIRS**

2
NEW RAFTS USED
.....
5

2
**PAIRS NO
LONGER
ACTIVE**

**OLD RAFTS
REPLACED**
.....
35
**LOON PAIRS
NESTING
ON RAFTS**

77
**SUCCESSFUL
NESTS**
(73% successful)

9
**NECROPSIES
PERFORMED**

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and deeper understanding of Vermont’s natural heritage. From its inception, VCE has been a leader in cataloging and mapping Vermont’s biodiversity. Enlisting a legion of community scientists and naturalists to support our efforts, VCE has led groundbreaking wildlife atlas projects, created vast crowd-sourced biodiversity databases, and conducted annual wildlife population monitoring that collectively power VAL.

Launched in 2013, VAL couples the power of community science with traditional biodiversity research and monitoring to quantify species diversity now and into the future. VAL joins other programs across the globe in curating species occurrence records at the Global Biodiversity Information Facility (GBIF), an international network funded by the world’s governments and aimed at providing anyone, anywhere, open access to biodiversity data.

“The data collected are imperative to map Earth’s biodiversity and guide conservation action,” says Michael Hallworth, a biologist and data scientist at VCE. “For instance, the International Union for Conservation of Nature (IUCN), the global authority that ranks the conservation status for species, relies heavily on community science observations to formulate its species status recommendations. Over 25% of IUCN data come from GBIF.”

VAL produces essential data needed for conservation, from local to global scales. Nearly 8 million occurrence records comprising more than 22,000 species from Vermont are curated at GBIF and searchable using the VAL Data Explorer (val.vtecostudies.org/gbif-explorer/). These records are derived from many sources, from museum specimens to field observations. The vast majority are submitted by community scientists who contribute over 95% of all Vermont biodiversity records. Vermonters have risen to the conservation challenge as our community scientists lead the nation, with more

21 ambitious target actions, including:

- Conserve at least 30% of land and sea areas globally.
- Restore at least 20% of degraded ecosystems.
- Reduce the introduction rate of invasive species by >50%.
- Contribute nature-based approaches to global climate change mitigation efforts.

Even though policies and actions to support biodiversity increased after COP-10, the drivers of worldwide biodiversity loss have intensified, accelerating biodiversity decline over the last decade. Globally, no countries have fully achieved the 20 Aichi Biodiversity Targets. For post-2020 actions to suc-

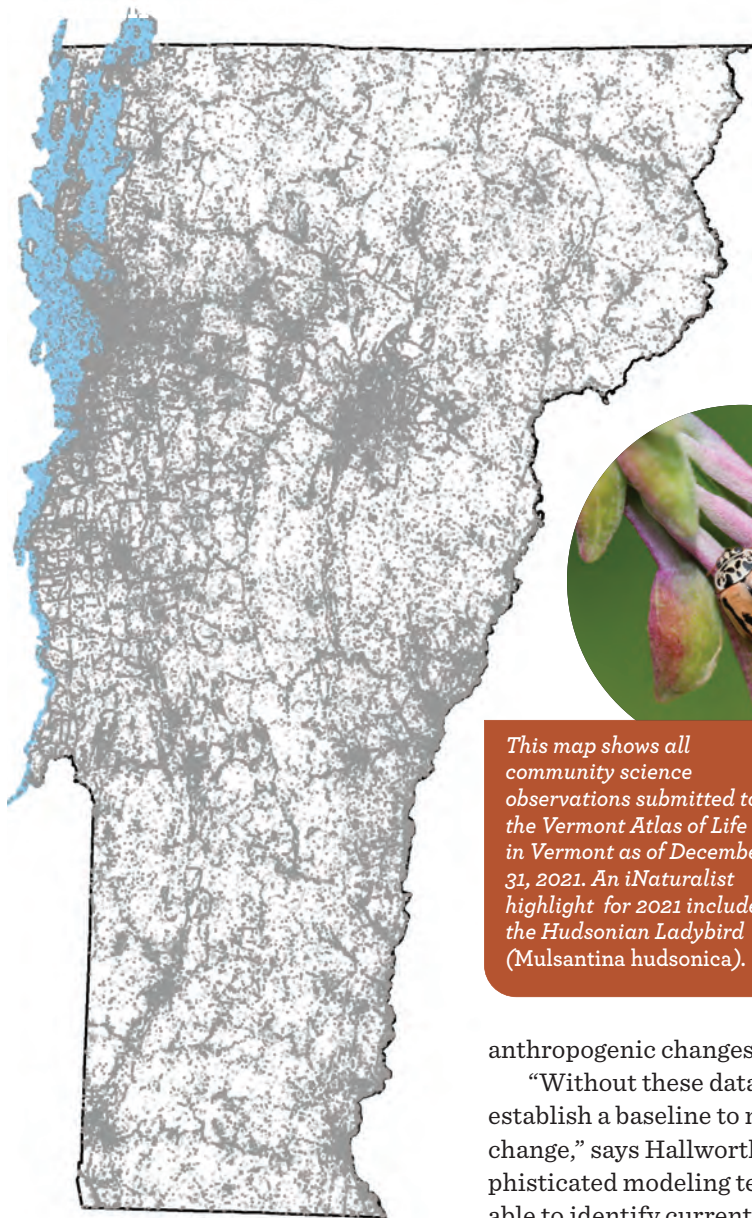
ceed, governments and organizations at both national and local levels need to step up their efforts to halt and reverse deteriorating biodiversity trends.

“We also need to monitor progress toward achieving these new targets, which requires documenting status and trends of biodiversity from around the world over time,” says VCE biologist Kent McFarland. “The Vermont Atlas of Life does exactly that here in Vermont while also contributing to the global picture.”

Think globally, act locally

Vermonters cannot respond effectively to climate change, natural disasters, invasive species, or other environmental and economic threats without a new

Community Observations



*This map shows all community science observations submitted to the Vermont Atlas of Life in Vermont as of December 31, 2021. An iNaturalist highlight for 2021 included the Hudsonian Ladybird (*Mulsantina hudsonica*).*

field observations per capita than any other state.

Documenting Earth's biodiversity through community science observations and other methods is a critical step towards conserving biodiversity for future generations, but VCE isn't stopping there. Our scientists are using these rich datasets to understand species' responses to climate and other

anthropogenic changes.

"Without these data, we can't establish a baseline to measure future change," says Hallworth. "By using sophisticated modeling techniques, we're able to identify current locations of biodiversity hotspots and unique communities on the landscape, *and* predict where they might be in 50 or even 100 years as the climate changes."

"We can also get a sense for which species might be most sensitive and vulnerable, now and into the future," says McFarland. "Most of this would be impossible without Vermonters being curious about the natural world and sharing their observations with us." **FN**



© 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



© SARAH BARTOS SMITH

Levi Smith

A moth expert in the making

BY EMILY ANDERSON

On a brisk November day, former VCE ECO AmeriCorps member Julia Pupko led 16 curious community scientists in search of Giant Silk Moth cocoons at Brookmead Conservation Area. Among the group of eager naturalists was Levi Smith, VCE's first-ever Youth Community Scientist of the Year. During the walk, Levi began sharing information about silk moths with those around him. It quickly became apparent that his knowledge of these insects was extensive, Julia recalls. "Not only can he tell you everything about each species' cocoon, but he also spends the weeks when the adult moths are flying

Levi is an avid iNaturalist user with nearly 13,000 observations representing over 2,700 species.

meticulously recording each individual attracted to his blacklight, staying up until all hours of the night."

Blown away by his depth of knowledge, Julia invited Levi to co-lead the next cocoon hunt in Zebedee Wetlands, and he accepted. "Levi arrived so prepared, complete with a bag containing old cocoons of each moth species," Julia ex-

plains. "He absolutely rocked that event."

Levi's dedication to studying these mysterious moths matches that of many VCE team members. "I have been light-trapping for Giant Silk Moths and raising them in captivity for a few years," he explains. "When I heard about the Vermont Giant Silk Moth Cocoon Watch last fall, I was excited to get involved." Levi not only participated—he also quickly became the project's top contributor on iNaturalist. "After I started posting cocoons, I got really interested in other taxa, like galls, mosses, fungi, and lichens," Levi says. "Now, I have been trying to post as many Vermont species as possible."

Today, Levi is an avid iNaturalist user with nearly 13,000 observations representing over 2,700 species. Each observation represents a single data point in the Vermont Atlas of Life, which helps VCE biologists and professionals across the state better understand and predict biodiversity trends. This constant process of discovery resulting in valuable data draws Levi to community science.

"I think biodiversity research is exciting because I can find species that nobody really knows anything about," Levi explains. "I have found a bunch that had not been recorded on iNaturalist in Vermont, including several species of stem miners and galls undescribed by science. I also just like walking around and looking for species I have never seen before. With environmental change happening so fast, I want to find and photograph species before they are gone."

We at VCE are deeply impressed with Levi's wealth of knowledge and outstanding contributions to our understanding of Vermont's biodiversity. Congratulations, Levi! **FN**

VCE's Youth Community Scientist Award recognizes the knowledge and dedication of naturalists younger than 18 years old who contribute to our science and conservation work. You can learn more about becoming a community scientist by visiting vtcostudies.org/volunteer/.



© KEVIN HALL

Ian Worley

Guarding the hallmarks of science in community science

BY RYAN REBOZO

“I was born looking around the world to see what was there.” Ian Worley’s innate curiosity may help explain why he began finding salamanders at age three, building model airplanes at four, and ultimately studying multiple disciplines—math, physics, biology, philosophy, history, literature, and theology.

With his broad interests and independent worldview, it’s no surprise that Ian’s first position after completing his Ph.D. in 1970 was to help create the University of Vermont’s (UVM’s) first interdisciplinary environmental studies program. Since then, his career has exemplified just how interdisciplinary this field can be. As a UVM faculty member, he taught courses in several departments, contributed widely to government agencies and nonprofits, and served on the Vermont Endangered Species Committee. Over the years, Ian regularly incorporated his airplane piloting skills into monitoring projects, conservation planning, decision-making, and community outreach. He has also mentored countless students, many of whom have made meaningful contributions to conservation efforts in Vermont and around the world (including VCE’s own Chris Rimmer in 1976!).

Today, Ian applies his expertise and passion to community science endeavors. He notes, “There are four hallmarks of modern science—repeatable methods, documentation, review, and publication.” In all tasks, he considers how to add rigor to community science projects and thus is drawn to participating in those that have all four hallmarks. Ian’s participation in eBird and VCE community science projects is an endorsement of their robust methodologies.

In 2009, Ian responded to a call for Vermont eBird Volunteer Reviewers from VCE’s Kent McFarland. What started as reviewing checklists in the Champlain Valley for an hour per week steadily grew to over 30 weekly hours validating lists for many locations worldwide, spanning the Arctic and north Atlantic oceans to the Subantarctic Indian Ocean. “I enjoy the global impact one can have as an eBird reviewer,” Ian explains. However, Ian isn’t only an energetic re-

Ian has consistently gone to extraordinary lengths as an eBird reviewer and outreach champion.

viewer—he’s also a major eBird contributor himself, having recently submitted his 25,000th checklist.

In addition to his enormous eBird presence, Ian also conducts community science field work to support VCE projects. For example, he has maintained Forest Bird Monitoring Program routes at Bristol Cliffs Wilderness Area and West Rupert for several years and conducted more than a decade of Eastern Whip-poor-will surveys at many locations, including on Snake Mountain, and in Pawlet, Monkton, and Hinesburg.

We at VCE recognize Ian’s contributions to community science and thank him for his outstanding work. As Chris Rimmer points out, he was nominated for this award because “Ian has consistently gone to extraordinary lengths as an eBird reviewer and outreach champion. Not only has he invested innumerable hours reviewing eBird reports from around the state, but he has offered meticulous feedback to those who have submitted exceptional (sometimes questionable) records. Ian has also submitted an extraordinary number of checklists himself. The amplified rigor of Vermont eBird owes much to Ian’s efforts.” Ian continues to be a vocal community science ambassador, encouraging participation in VCE’s ever-expanding long-term monitoring projects. “Keep up the good work, keep the four hallmarks of science in front of you, and remember: monitoring outlasts the monitors.” **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.

FIELD NOTES

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Common Green Darner {*Anax junius*}



➤ A Common Green Darner perches on the tip of a fern.

© JERRY MCFARLAND

This stunning migratory insect will soon make its annual southward trek.

BY NATHANIEL SHARP

If I described an organism as large, colorful, and migratory, you would likely think I was talking about a bird, right? Well, 'large' may be relative here, but I'm actually referring to North America's most impressive dragonfly, the Common Green Darner. This blue-and-green migratory marvel can be found across Vermont, hovering inches above ponds or hundreds of feet above fields. Like other dragonflies, these ferocious predators use the agility their four wings allow to hunt down other flying insects in impressive aerial dips and dives. Head out to any large field in late summer, and you may see a dozen or more of these winged wonders patrolling the skies at dusk.

People have admired the Common Green Darner for centuries; however, it was only recently that a study conducted by VCE and sev-

eral partner organizations revealed the darners' fascinating migratory pathways. Analyzing wing tissue samples from over 800 Common Green Darner wing specimens dating back more than 140 years, VCE's research team was able to determine the approximate latitude where individual darners hatched. Each wing acted as a puzzle piece, finally revealing an extraordinary map. Green darners routinely undertake a staggering, multi-generational migration of over 300 miles, and sometimes as far as 1,500 miles. Each Common Green Darner generation completes a different part of the annual migratory journey, with one generation migrating north in spring, the second south in fall, and the third remaining resident in the southern part of the species' range in the winter.

Common Green Darners are the first migratory dragonflies to arrive in New England, indicating that spring is on the way. This past spring, VCE's 'Northeast Darner Flight Watch' mobilized naturalists across the state to document the first green darners arriving in Vermont. Surprisingly, our first green darner observation took place much later and farther north than we expected, occurring in the very northwest corner of the state. That led us to wonder: was this late arrival part of a long-term trend or a one-off event? Do Common Green Darners enter Vermont from the south or venture north before turning south down the St. Lawrence Valley? With the help of community scientists all across the Northeast, we hope to answer these questions and many more as we continue our investigations into this well-traveled insect's intriguing life cycle. **FN**