

Field Notes

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

Plant and Pollinator Interactions

PIP project documents the birds, the bees, the flowers, and the trees.

| ALEX JOHNSON

Well, the time's come to give you the talk. You know, the one about the birds and the bees—and the plants they visit. We're of course talking about our Pollinator Interactions on Plants (PIP) project, launched last year.

As its name implies, this project aims to document interactions between individual species of fauna and flora. Any animal photographed at a flower is eligible, including bees, butterflies, birds, and flies. In a nutshell, we're connecting the dots that make up the plant-pollinator food web. These data points give us key information about what traits predict flower visitation, how these

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FIELD NOTES

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

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VCE VIEW



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A recent editorial in the journal *Nature*, citing findings of a 2023 UNESCO report, championed the importance of two practices at the very core of VCE's work: citizen science and open science.

This issue of *Field Notes* features articles about community scientists—whom we used to call “citizen scientists”—contributing to research on plant-pollinator interactions and to a butterfly atlas that is tracking long-term population changes. The participatory approach that is a hallmark of VCE's research and monitoring activities is also a component of open science, described in the editorial as a set of values and practices that make science more “collaborative, transparent, accessible, equitable, and inclusive.” The editors go on to acknowledge that “there is still much work to do to fulfill the potential of open science globally.”

We aspire to do our part wherever we work. As I write, a committee within the Vermont legislature is considering a bill that would ban neonicotinoids, a class of widely used insecticides documented to have detrimental effects on bees and other pollinators.

Data can inform their deliberations. Since 2021, the Vermont Bee Lab at the University of Vermont has worked with

beekeepers to study pesticide dispersal and toxicity. At sites in five Vermont counties, they collected samples of pollen from within beehives, on bees returning to hives, and on plant material. Samples were tested at Cornell University for a broad range of toxins. Lethal, sublethal, and significant concentrations were found at many sites.

In addition to our involvement through this partnership, VCE Conservation Biologist Kent McFarland provided testimony in support of this bill based on more than a decade of bee data collected by our science team. It's another way that VCE is helping to bring science to light and ensure that decision-makers, as well as the public they serve, have accurate and timely science to guide their decisions.

To learn more about VCE's commitment to open science, I urge you to read a 2015 blog post by former VCE Director of Science John Lloyd (search for “VCE Embraces Open Science” at vtcostudies.org). Incidentally, this post from 2015 states that we are “about to launch the Vermont Atlas of Life.” How far we've come since then!

Susan Hindinger
EXECUTIVE DIRECTOR

A Hackberry Emperor (*Asterocampa celtis*) pauses on a sunlit tree trunk.



© SHARON GLEZEN

Botanizing for Butterflies

A tale of curiosity and urban exploration | BY NATHANIEL SHARP

We are so grateful to our many Vermont Butterfly Atlas volunteers for their efforts to document butterflies across the state. Without them, our successful first year would not have been possible.

Finding some butterfly species, such as Vermont's newly discovered Bog Elfin (*Callophrys lanoraieensis*), can require hours of searching nearly inaccessible habitats. Others can be discovered in such unexpected places as Vermont's busiest street. The first year of the Second Vermont Butterfly Atlas has yielded many butterflying tales, and one in particular stands out as "a true community science success story" in the words of atlas volunteer and University of Vermont (UVM) physician Sharon Glezen.

One sunny day last September, Sharon received *The Chrysalis*, VCE's periodic butterfly atlas newsletter, in her inbox and immediately heeded a call to search for a seldom-seen but-

terfly species, the Hackberry Emperor. True to its name, the caterpillars feed on hackberry leaves, and wherever hackberries are found, adult Hackberry Emperors can often be spotted perched or flying nearby. Eager to seek out this rare butterfly, Sharon got to researching. Using online databases such as the Vermont Atlas of Life on iNaturalist (inaturalist.org/projects/vermont-atlas-of-life), she was able to quickly learn how to identify Common Hackberry (*Celtis occidentalis*) and found that there were iNaturalist records of this tree all over UVM's campus.

With a blend of curiosity and patience, Sharon began taking short breaks from work to scan the hackberries that line Main Street. Before long, her efforts paid off! On one of these nature breaks, she noticed the unmistakable spotted wings of a Hackberry Emperor perched on the distinctive ridged bark of a hackberry trunk. Sharon described her whole process on her eButterfly checklist. "Learn about emperor butterflies in *The Chrysalis*," she wrote. "Learn what a hackberry tree looks like—learn from iNaturalist where hackberry trees may be found—learn that hackberry trees line Main Street in the middle of the UVM campus (where I just so happen to work)—sneak out of the office periodically to check hackberry trees—have patience—find a Hackberry Emperor in all its glory—heart goes pitter-pat."

Although it can seem intimidating to learn about the diverse array of butterflies in Vermont, Sharon shows us that all it takes to make an exciting discovery is curiosity, patience, and the power of community science. We are so grateful to our many Vermont Butterfly Atlas volunteers for their efforts to document butterflies across the state. Without them, our successful first year would not have been possible. If Sharon's story inspires you to search for butterflies, consider volunteering for the atlas this spring or summer. **FN**

A Common Yellowthroat
(Geothlypis trichas)



Go ALL IN for Biodiversity with VCE!

At VCE, we envision a brighter future for biodiversity, one in which community-driven science consistently informs sustainable stewardship of the environment. Our pursuit of this vision gains urgency each year as we document both alarming declines in once-common species and conservation successes enabled by our work. To act on this urgency, we crafted a comprehensive organizational strategy in 2018 that calls for significantly expanded capacity.

We are beyond excited to invite you to be a part of VCE's next chapter. With a \$5 million goal over and above VCE's annual operating expenses, the ALL IN for Biodiversity campaign funds three critical areas of growth.

➤ **Investing in pioneering science.** Building knowledge and increasing

the scope and impact of our science by expanding the Vermont Atlas of Life, adding new fields of expertise to our team of conservation scientists, and enhancing long-term monitoring with cutting-edge research.

➤ **Collaborating for conservation outcomes.** Putting our science to work for conservation by introducing evidence-based stewardship strategies to landowners, legislators, and other key decision-makers, engaging in action-oriented partnerships, and creating practical tools to protect biodiversity.

➤ **Expanding our vision for community science.** Broadening the community that participates in and benefits from field studies by cultivating diversity in our corps of volunteers and the field of community science itself.



© ALYSSA FISHMAN

We envision a brighter future for biodiversity, one in which community-driven science consistently informs sustainable stewardship of the environment.



© DAN LAMBERT

There's no better time than the present to help make these goals a reality. The Jack and Dorothy Byrne Foundation will match all gifts to VCE's ALL IN for Biodiversity campaign, dollar for dollar, up to \$50,000. But this special effort and match opportunity will end when Blackpoll Warblers return to Central Vermont in May.

If you're ALL IN for Biodiversity too, please consider making a gift today!

Checks payable to Vermont Center for Ecostudies can be mailed to VCE at PO Box 420, Norwich, VT 05055. Please write "ALL IN" on the memo line. Or donate online at vtecostudies.org/give and choose the ALL IN for Biodiversity designation. **FN**

© JULIE FILIBERTI



VCE Conservation Biologist Steve Faccio shows a mass of salamander eggs to curious onlookers.

Above: Volunteers prepare a loon raft at Pensioner Pond.

Are you ready to go **ALL IN** for Biodiversity with a gift of lasting impact?

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We'll be glad to help.

- Name VCE as a beneficiary of a retirement plan or life insurance policy.
- Include VCE in your will or living trust.
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The Migration of Female Bicknell's Thrushes

A banded Bicknell's Thrush (Catharus bicknelli) is released.

VCE scientists embarked on a field expedition to band female thrushes in Reserva Zorzal, where they are known to overwinter.

| BY RACHEL MCKIMMY

Bicknell's Thrush is an iconic species of the northeastern mountains, where it nests in dense stands of Balsam Fir (*Abies balsamea*) and Red Spruce (*Picea rubens*). Studies by VCE and collaborating institutions have yielded many discoveries, both surprising (adult males significantly outnumber females) and troubling (U.S. populations are declining by about 4% per year). New VCE research aims to determine whether these separate findings are in fact related.

In October, most Bicknell's Thrushes fly south to overwinter in the wet, broad-leaf mountain forests of the Dominican Republic (DR), with smaller numbers settling elsewhere in the Caribbean. By late May, when the birds return to their northern breeding grounds, the ratio of males to females is skewed—as high as 4:1 in some areas—even though nestling and fledgling sex ratios are not skewed.

“Our tracking data are heavily male biased, and we know very little about what the females of the species are doing, in part because they don't always come back to the same territory,” explains VCE Data Scientist Dr. Michael Hallworth. “We're not painting the full picture if we don't get information from both sexes. Understanding threats to females may be much more important because as the sex that lays the eggs and provides more nestling care, they're the determining factor as to how quickly a population can grow.”

To learn more about females outside of the breeding season, VCE scientists recently visited the DR with funding from the U.S. Forest Service's International



Jim Goetz doing field work in the DR

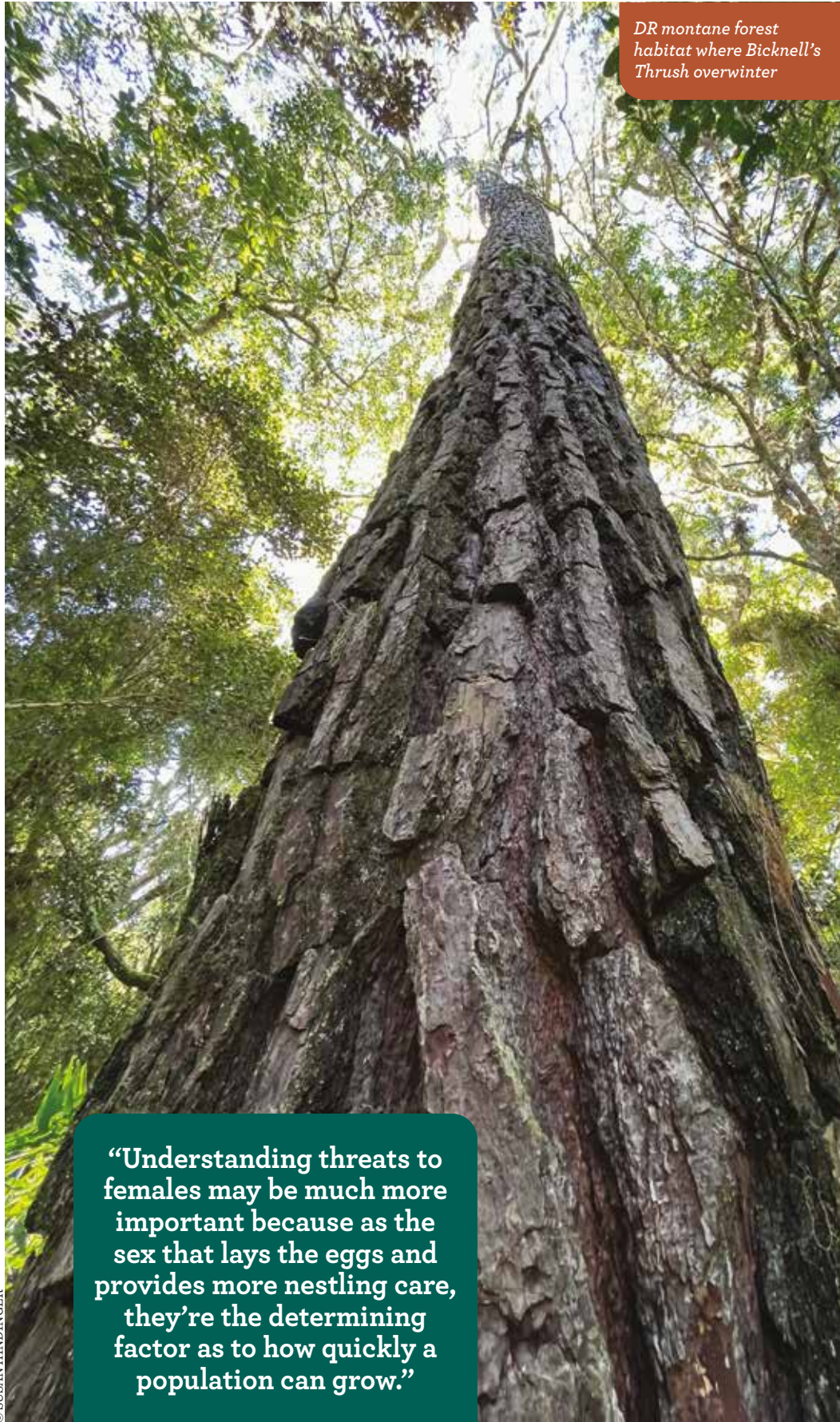
© SUSAN HINDINGER

Programs. Past research had already shown a type of sexual habitat segregation on the wintering grounds: males take over higher-quality, wet forest habitats while females are left with lower-quality drier habitats. In February, Hallworth, along with VCE Caribbean Conservation Coordinator Jim Goetz and Conservation Biologist Dr. Desirée Narango, embarked on a field expedition to band female thrushes in Reserva Zorzal, where they are known to overwinter.

The scientists captured females and affixed Motus tags, which transmit a signal that can be detected by towers along the bird's migration route. As Hallworth explains, "We could conserve all of the northern peaks in perpetuity, but if there are no females to breed with the males, then the population will decline. So we need to figure out where in their annual cycle females are dying—and why."

As spring arrives, we eagerly await the first detection of these birds as they journey from the Caribbean back to their breeding grounds. Who knows? One might even signal a tower on Mount Mansfield, where Narango operates a banding station established three decades ago by VCE Emeritus Director Chris Rimmer. It wouldn't be the first time that particular mountain yielded valuable information to guide conservation of one of North America's rarest songbirds. **FN**

© SUSAN HINDINGER



DR montane forest habitat where Bicknell's Thrush overwinter

"Understanding threats to females may be much more important because as the sex that lays the eggs and provides more nestling care, they're the determining factor as to how quickly a population can grow."



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!

Whip-poor-wills

On moonlit evenings from May through July, adventurous volunteers conduct surveys by listening for Whip-poor-wills' distinctive call.

vtecostudies.org/projects/forests/whip-poor-will-project

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 standard protocols and using VCE-provided equipment.

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

To learn more about volunteer opportunities, visit vtecostudies.org/volunteer.

CHANGES AT VCE

A FOND FAREWELL

Defining the work and expertise of Nathaniel Sharp is no easy task. He's a trained biologist, ornithologist, lepidopterist, and melittologist. He's also a birder, butterfly watcher, and community scientist. These identities, however, only begin to scratch the surface of Nathaniel's talents. Anyone who has joined Nathaniel in the field or listened to him present knows he is a true 21st-century naturalist with tremendous ability to ignite wonder and passion for the natural world in everyone he meets.

The Vermont Atlas of Life was extraordinarily lucky to have Nathaniel serve as our first community science outreach naturalist in 2018 through ECO AmeriCorps. He hit the ground running, and we quickly began receiving messages extolling his expertise, unassuming and kind nature, and patience. Needless to say, we couldn't let him go after his service year concluded. He stepped into a staff biologist role, where he proved to be an indispensable member of VCE's science team. Over the past five years, he helped us discover new bees, record beautiful butterflies, keep Vermont eBird strong, and expand the use of iNaturalist. He even encouraged us to appreciate deer flies.

As Nathaniel sets out this spring on his next grand adventure, we're left a bit wistful for his remarkable time at VCE. Even so, we're excited to see him share infectious energy and wonder for the natural world at the next stop on his professional path. Perhaps one day you'll be lucky enough to find him standing in the coastal Maine fog, eye to a scope, and join him for what may be a life-changing experience in nature.

Thank you, Nathaniel, for igniting the wonder in so many of us. We appreciate you! **FN**

CONGRATULATIONS

We're thrilled to announce that Laura Prothero, until recently VCE's development manager, has accepted a new role as our director of development. Laura joined VCE in 2021. In addition to her wealth of previous development experience, Laura brings passion for mission-driven fundraising and wholehearted kindness to her work every day. In her new position, she will take a more front-facing role in stewarding VCE's supporters and assisting with long-term planning. We can't wait to see VCE soar to new heights with the benefit of her development leadership. **FN**



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© LAURA PROTHERO



Patricia McGovern

Community Scientist of the Year

| BY ALEX JOHNSON

McGovern's enthusiasm for not only plants but their pollinators sparked a lot of community momentum on VCE's Pollinator Interaction on Plants project.

Each year, VCE recognizes a volunteer who goes above and beyond in commitment to community science with our Community Scientist of the Year Award. Patricia (Pat) McGovern was granted the 2023 award for work in her local community garden.

McGovern works at the Canillas Community Garden in Lebanon, New Hampshire, and helped plant their first pesticide-free pollinator garden. After being recruited by VCE Conservation Biologist Dr. Desirée Narango, McGovern became interested in the different kinds of pollinators that exist in her community. She had been a gardener for many years but had never really paid attention to specific species of insects. Doing so opened up a whole new world to her.

"I found a Yellow-striped Bumble Bee. Before I got involved with this project, I would've just said it's a bumble bee, but this species hadn't been seen in the state in decades!" McGovern continues, "It's exciting to learn that there are so many different kinds of bees, that not all of them are the same, that each one has different needs and different ways of interacting with the world."

McGovern's enthusiasm for not only plants but their pollinators sparked a lot

of community momentum on VCE's Pollinator Interaction on Plants (PIP) project. Her focus on creating pesticide-free pollinator gardens that are filled with native plants and bloom throughout the seasons played a big role in attracting different kinds of insects.

"There was a traffic island we planted in downtown Lebanon last year," McGovern recalls. "All through the fall, that island was filled with life. Cars were coming in three directions, and still the spot was full of diversity! The goldenrod was filled with all different kinds of wasps, bees, and flies."

Narango states that McGovern is the best kind of volunteer to have when a project is trying to get off the ground. "She not only collected a ton of data; she also helped engage a lot of people, which is everything you could want in the pilot year of a project."

McGovern continues to both volunteer for PIP and help run the Canillas Community Garden, now part of the Pollinator Pathway Network. As temperatures continue to warm this spring, be sure to visit the garden, and be on the lookout for pollinator activity. You may also see Pat, diligently working or enthusiastically talking with visitors. **FN**

Common Eastern Bumble Bee
(*Bombus impatiens*)



© DESIRÉE NARANGO

patterns change across the region and throughout the year, and what aspects of global change (like urbanization) affect these relationships. These data can also help identify keystone plant species or plants that are especially important for supporting local food webs.

Picture your own garden (or, in my case, the garden of a friend blessed with a green thumb). Some of its flowers will attract many species, whereas others may only attract a few. What if some flowering species attract both rare and common wildlife? Where should wildlife-loving gardeners plant those flowers? Questions like these form the basis of the PIP project. Project leader and Conservation Biologist Dr. Desirée Narango states that the overall aim is to “understand how plant-pollinator interactions vary across space and time in the Northeast in order to make better tools for plant selection and restoration that prioritize biodiversity conservation.” In fact, Narango is already

partnering with the Native Plant Trust and colleagues from the plant-pollinator Morpho synthesis group to create plant-selection tools for gardeners.

There’s a lot of information to collect, and you can help. PIP is a community science project! To participate, contribute your observations directly to the iNaturalist project page ([inaturalist.org/projects/pollinator-interactions-on-plants-pip-of-the-ne-us](https://www.inaturalist.org/projects/pollinator-interactions-on-plants-pip-of-the-ne-us)). Armed with a camera or your phone and the iNaturalist app, you can document every interaction you see and upload it to the project. If your cousin’s-friend’s-mom has a lovely patch of flowers where a cool butterfly can be found, we want to know about it! Still, no gardens are required—you can do this from anywhere. We’re interested in all kinds of green spaces where flower visitors can be found: backyards, mountaintops, bogs, lakesides, you name it. In fact, collecting data in different habitats at different times strengthens our dataset.

There are more advanced steps if you are new to the app, so if you want your observations to be included in our project, please follow the directions in the online project summary. If you want to master the app, read the tutorial on page 11.

Even as PIP channels observations into iNaturalist, it also serves as an umbrella for other smaller projects. For example, we are comparing plant-pollinator networks across 12 locations in the Upper Valley region of the state, including restored meadows, botanical gardens, and plots dedicated to community agriculture. We hope community scientists will record observations at these locations to add to our more comprehensive and systematic surveys at those same sites. This project’s community science component helps us understand differences in pollinator communities while enabling a comparison of different data-collection methods.

In just one year, the project has amassed more than 32,000 observations! Eye-opening discoveries include Ruby-throated Hummingbirds (*Archilochus colubris*) visiting 215 flower and tree species and an abundance of Yellow-banded Bumble Bees (*Bombus terricola*) (a species of greatest conservation need in Vermont) in urban gardens.

The comparisons we can make across species and scales make this project particularly interesting. Data are gathered to make inferences at a local level, a regional level, and even a national level; however, at the end of the day, this project can only be successful if we synthesize enough data to draw sound conclusions. To do that, we need a strong community.

According to Narango, we’re off to a good start. “This project has only been going on since February 2023,” she recently remarked, “and I’m already astounded by the excitement that people have to collect data, curate data, and just learn more about the questions we’re asking.” **FN**



© STEVE RUHL

A Few Notes Go a Long Way

For many observations, adding annotations—notes that detail specific attributes—boosts their quality as data points.

BY EMILY ANDERSON

Spring is here, and for those who enjoy gathering data through iNaturalist, that means our observation options are rapidly expanding. However, if you're homebound by deep mud, spring showers, or other life circumstances, you can still participate in a community science project!

For many observations, adding annotations—notes that detail specific attributes—boosts their quality as data points. For example, adding that a plant is flowering, fruiting, or budding in an image helps scientists track how natural systems are responding to climate change. Some research initiatives, including VCE's new Pollinator Interactions on Plants (PIP) project, examine relationships between multiple species and rely on annotations to build a thorough understanding.

"It's really useful to have people annotate so that we have more replicates of specific plants and pollinators interacting," says VCE Conservation Biologist Dr. Desirée Narango, PIP project leader, "especially for species that are not as common. We're missing a lot of interaction, life history, and phenology data for many bees and butterflies, so adding annotations to those observations is really valuable."

If you're new to adding these kinds of notes, you can find a step-by-step tutorial at bit.ly/inaturalist-tech-tip. **FN**

The following instructions describe how to annotate flowering plants, but the same basic steps apply to anything on iNaturalist.

1. After logging into your account, click on the "Identify" tab at the top of your iNaturalist page.
2. Enter "Vermont, US" into the place search box and click "Go." This will limit your search to Vermont.
3. Enter a name into the species search bar to narrow your search. You can also type in a larger group. For example, "flowering plants" (subphylum Angiospermae) will show you all the flowering plant observations in Vermont.
4. Add some filters to help narrow your search ("Filters" is located to the right of "Go"). For spring wildflowers, add "research grade" under "Quality Grade" and the most probable flowering months (March–July) under "Date Observed."
5. Narrow your search to flowers that need annotation. Under "Description and Tags," click on "More Filters." Open the drop-down menu under "Without Annotation," and select "Plant Phenology." Leave the second drop-down menu set to "Any."
6. Click "Update Search" at the bottom of the filter box.
7. You should see a grid, map, or list displaying observations. Click on the first one, and select the "Annotation" tab. Under this tab, open the drop-down menu next to "Plant Phenology" and select the appropriate phenological stage (flower budding, flowering, or fruiting) based on the observation's photo. If none of the options are applicable, select "No evidence of flowering."
8. When added successfully, your annotation should appear next to "Plant Phenology" with your profile picture. To get to the next observation, either click on the arrow to the right of the observation box or hit the right-facing arrow on your keyboard.

FIELD NOTES

VERMONT CENTER FOR ECOSTUDIES
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Sandbar Willow *{Salix interior}*



© SPENCER HARDY

Many insects are attracted to the Sandbar Willow, including one that can't be found anywhere else: the Sandbar Willow Fairy Bee.

| BY SPENCER HARDY

Willows, well known as early spring flowerers, are a nightmare to identify, even for experienced botanists; but, as with most things in the natural world, there are exceptions to the rule. Enter Sandbar Willow (*Salix interior*), an easily overlooked shrubby species found on the sandy shores of Lake Champlain and along several major rivers in the state. It may also turn up in unexpected places, such as under a dock on the Burlington waterfront. Unlike other Vermont willows, which bloom exclusively in spring, the Sandbar Willow flowers in summer. In addition to its unique phenology, this species can be readily identified by its narrow, nearly linear leaves.

Early-spring willows are a favorite food source for hundreds of different polli-

nator species, including a half dozen bees that gather pollen exclusively from these plants. By June and July, however, many bees have already completed their life cycles and are dormant, awaiting the next spring. That doesn't mean the July blooms of Sandbar Willow are quiet—quite the opposite. Many insects—ants, beetles, and bees—are attracted to the Sandbar Willow, including one that can't be found anywhere else: the Sandbar Willow Fairy Bee (*Perdita maculigera*). This 4-millimeter bee has a similar range and phenology to its host plant: distributed from the Appalachians west to the Rockies and flying from June through early August. Two Vermont records are the only known sightings of this species in New England, but more targeted surveys of Sandbar Willow are likely to reveal additional locations.

Tiny bees aren't the only reason to pay attention to Sandbar Willow. This plant seems to thrive on sand and gravel deposits along larger rivers and likely plays an important role in stabilizing banks during flood events. Channelization and damming of Vermont's rivers over the past 300 years has certainly altered stream-flow patterns and probably reduced the available habitat for this species, with consequences for both rare bees and downstream villages. Flooding is a powerful reminder of the value of healthy riparian habitats and the attention that they deserve. **FN**