

# Field Notes

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

## State of the Mountain Birds

**Our report details the population status of ten focal species based on data collected since 2001.**

BY JOHN LLOYD

The evergreen forests that drape high mountain slopes of the northeastern U.S. are home to a special group of birds. Outside of these mountains, most inhabit only the boreal forests of northern Canada and Alaska. Every summer since 2001, hundreds of dedicated citizen scientists have taken to the high country from New York to Maine to count these mountain birds as part of VCE's Mountain Birdwatch (MBW) program. The data collected by these intrepid volunteers each year allow us to assess the status of mountain bird populations and to recommend conservation interventions when warranted.

Now, for the first time in the history of MBW, we've assembled all the data collected over the years to answer a seemingly straightforward question: how are mountain birds faring in the northeastern U.S.? In our recently released *State of the Mountain Birds* report, we present indicators of population health for each of ten focal species, based on annual counts by Mountain Birdwatchers. These indicators reveal which species are thriving, which are holding their own, and which may be in need of our help. In doing so, we seek to understand where conservation efforts have succeeded, and where they have not. Where efforts have (*continued on page 6*)



*Populations of Bicknell's Thrush, avian icon of the mountains, have been largely stable on Mountain Birdwatch surveys, with some evidence of modest declines in recent years.*

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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 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.

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## VCE VIEW



**H**uman resilience and optimism never cease to amaze. We have all been bombarded in recent months with news that, if not outright catastrophic, has been deeply disturbing and disheartening. A succession of ravaging hurricanes and earthquakes; intense wildfires scorching 2 million acres in the western U.S.; a trillion-ton iceberg calving from the Antarctic's Larsen ice shelf; massive bleaching of the planet's largest living structure, Australia's Great Barrier Reef. Superimpose the steady, inexplicable denial by many policy-makers of our changing climate, and one has to ask how any of us humans can maintain a hopeful outlook.

Of course, the answer is fundamentally simple. We believe, we hope, we persevere because there is no viable alternative. Despite truly daunting odds for the future of our mothership, inaction and despair are not options. We humans may have our shortcomings as ecological stewards, but

we are resourceful, occasionally even wise, and action-oriented when the chips are down. During the past year or so, the degree of impassioned activism, of people uniting around causes, of collective standing up against injustices has reached extraordinary new levels. Some voices have been justifiably loud, even strident, while others have taken a quieter, but no less fervent or effective, tone. We at VCE place ourselves proudly and confidently in this latter category.

It will surprise no reader of this column to know that VCE does not take sides in political issues, or advocate positions in conservation debates without a strong foundation of scientific data. We let our science do our talking, our engagement of people be our call to action. We're convinced that our dual approach of providing science-based solutions to conservation and engaging people as citizen scientists is right for us. To some, ours might seem a "timid" strategy, given the monumental challenges facing us all. We believe it is anything but that. By applying rigorous science to today's complex issues, directly involving citizens in collecting and caretaking wildlife data, and imparting our experience as mentors, we achieve a profound multiplier effect.

Moreover, engaging you, our constituents—uniting people and science for conservation—inspires a two-way street of hope, and it spurs action. Your commitment and zeal inspire us; we hope VCE's mission stokes your passion. None of us can deny the ecological calamity that looms large on Planet Earth. But, none of us should doubt our collective capacity to restore balance and bring about positive change. Too little, too late? We at VCE think not. We can do what must be done, together. **FN**

*Chris Rimmer*  
EXECUTIVE DIRECTOR



Sid Bosworth of UVM Extension talks about hayfield management at a June 2017 workshop sponsored and organized by VCE and Upper Valley Land Trust.

Bird bander Michael Corcoran holds a female Bobolink ready to be released.

# Going Grassroots

Working with landowners to sustain nesting habitats for vanishing grassland birds. | BY ROZ RENFREW

On a typical morning in early May, “retired” farmer Paul Miller ventured into a paddock in Vernon, Vermont to move cattle when he noticed two Eastern Meadowlarks. Their unmistakable bright yellow chests with black “V” chevrons presented a rare sight, and he assumed that the birds were passing through. But when local birder Hector Galbraith saw them there a few days later “acting nesty,” VCE’s Cat Abbott wasted no time to investigate. After talking with Cat, Paul and his sons decided to rest his paddock to protect the nesting pair.

Over the past three summers, Cat has been reaching out to landowners in the Upper Valley and beyond. Her charge is to create and sustain nesting habitat for vanishing grassland birds on private lands amidst the realities of economic, aesthetic, and other competing objectives. So far, Cat has provided guidance to landowners on 800 acres of fields, where grassland birds can fledge young year after year. Cat’s cadre has grown to 59 landowners on 45 properties.

If it weren’t for the tall grasses of hayfields, a declining species like the Bobolink would barely exist in the Upper Valley, or elsewhere in the Northeast. Their nests fail, however, if mowing occurs too soon, but delayed mowing compromises hay quality, creating a conservation conundrum.

Keeping birds in the equation of land management over the long term requires a customized approach. Cat visits properties and creates a plan with the owner or manager that best suits their combined interests and constraints. “I love to find compromises that improve grassland bird habitat without burdening the landowner” says Cat. “Everyone I’ve worked with would like to help the birds, and many are able to adjust their practices in some way, but often on working farms this involves a difficult sacrifice. It’s tough to ask folks who are already working so hard to do even more.” She shares with landowners the timing of each species’ nesting period, how to reduce bird mortality when fields are mowed, and how to access federal and



private cost-share programs.

Mary and Carl McCuaig own a 35-acre hayfield at Top Acres Farm in Woodstock, active for three generations. After Cat walked their field with them late in the nesting season, they agreed to postpone haying the portion of the field with nesting Bobolinks for a few more days. “Making small tweaks can translate to big benefits for the birds” says Abbott. The McCuaigs mentioned this change to one of their hay customers, who appreciated their concern for the birds.

VCE has hosted a landowners’ workshop, staffed the annual “Strolling of the Heifers” in Brattleboro, and participated in other events to generate interest in grassland bird conservation. Cat intends to continue building the momentum. “Enthusiasm and concern for grassland birds seem to be infectious,” she says, “I’ve noticed geographic clusters where landowners are managing for grassland birds and apparently inspiring their neighbors to do likewise.” **FN**





What lives here? Where is it? What's common? What's at risk? The Vermont Atlas of Life brings over 150 years of accumulated knowledge of the biodiversity of Vermont into currency for science and society. It's a biodiversity warehouse where anyone, anywhere, anytime, can explore, learn, and share Vermont's unique biodiversity.

**We hope you'll join  
our efforts!**

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## Sara's New Adventure

**Farewell to Sara, welcome to Maya** | BY CHRIS RIMMER

**T**he VCE office may be decidedly quieter and just a bit less rambunctious these days, but the same can hardly be said for the Zahendra-Griswold household. Conservation Biologist and VPR Outdoor Radio co-host Sara Zahendra, a fixture (and force of nature!) at VCE since 2010, has transitioned to full-time parenting, as she and Karl welcomed baby Maya into their lives last March. We had ample warning of this change, of course, but Sara's day-to-day absence from the lunch table, staff meetings, and the overall VCE dynamic has left a void that defies being filled. Her enthusiasm and people skills, humor, sharp wit, attention to detail, and compassion for others have left an indelible mark on VCE. And, her trademark, behemoth zucchini bread loaves? Thankfully, those still appear on the table from time to time.

Needless to say, we at VCE couldn't be more delighted at Sara and Karl's good fortune to have Maya front and center in their lives. We eagerly await periodic mom-and-daughter visits, when we all line up, waiting patiently to "hold the baby." Of her new role as a parent, Sara reports that "We were prepared for the late nights, the delirium, the exhaustion. We were completely caught off guard by the smiles, the laughter, and the sheer delight she has brought to us. She is a happiness we could never have imagined."

And, filling Sara's metaphorically large shoes? Somehow we've survived so far without our "Queen" bumble bee and Whip-poor-will maven, Field Notes editor and chief whip-cracker, photo archivist, and no-holds-barred commentator. Fortunately, Sara has promised to continue keeping Kent honest as co-host of Outdoor Radio, a role she and thousands of VPR listeners relish each month. That ensures she'll remain firmly ingrained in the VCE web of life, and we wouldn't have it any other way. Thanks, Sara, and welcome to the family, Maya! **FN**



*As Vermont's loon population increases, interactions between loons appear to be on the upswing, but the record high chick survival rate of 81% in 2017 indicates that most breeding pairs can handle the increased competition and interference.*

# Keeping Tabs on Loons

**Observations by volunteers help us interpret and manage nesting loons on Vermont lakes.** | BY ERIC HANSON

**A**fter another amazingly successful loon breeding season in 2017, we extend a heartfelt “thank you” to our many volunteers, to our longtime partner the Vermont Fish and Wildlife Department (VFWD), and to lake associations and the general public for their invaluable dedication to conserve Vermont’s Common Loon population. Not only did a record number of loon pairs (97) nest statewide, but we enjoyed record chick survival of 81% (95 chicks at the end of August), a record number of adults counted on loonwatch day (308), first-time hatches on several ponds (Curtis, Dog, Green River at Merganser Inlet), and success after many years of failure on others (May, Echo-Charleston, West Mountain). Observations by volunteers help us interpret and manage nesting loons on many Vermont lakes, and below we highlight a few of 2017’s most interesting stories.

Solo parenting can work. A member of the breeding pair on South Pond (Marlboro) became entangled in or ingested fishing gear in late July. We

could not capture the bird during a late night attempt, and volunteers reported it missing a few weeks later. We can only guess that the compromised loon did not survive; however, the other parent successfully raised their two chicks into September. On Lake Eden, one loon parent snared a hook in July. Again, we were unable to catch this loon during a night capture attempt, but two days later the bird beached itself. Lake residents successfully rescued it, and VFWD game warden Jeremy Schmidt delivered it to wildlife rehabber Craig Newman of Outreach for Earth Stewardship. Craig and Richmond veterinarian Dan Hament removed the hook and released the loon back on Lake Eden. Based on subsequent reports by Lake Eden volunteers, a single adult attended the chick for the remainder of the summer, and apparently kept the “weakened” parent away from the chick. Single parenting does not always succeed, however, as we observed on Sunset Lake (Marlboro), where one of the mates was found dead near shore, and within a week, the re-

maining chick disappeared.

As observed region-wide, Vermont pairs are often less successful on large, multiple-territory lakes where loons frequently intrude on territories of other breeding pairs; this can prevent nesting, cause nest failure or chick loss, and lead to increased rates of territorial takeovers. Volunteers and lake residents observed frequent chases and intruder loon interactions on several lakes where loons ultimately did not nest in 2017, including Peacham Pond (3 pairs), Little Averill (2 pairs), and Groton-South (the North pair had two chicks). For a second consecutive year, the Maidstone-SW pair lost its chick because of an intruder loon. These confrontations also occur on single-territory lakes, but impacts on chick productivity appear to be more severe on larger lakes. That said, loons can be very productive on larger lakes, as evidenced by two successful hatches on Norton Pond and three on Green River Reservoir in 2017.

With Vermont’s increasing loon population, interactions between loons appear to be on the upswing, but, so far, high chick survival rates indicate that most breeding pairs can handle the increased competition and interference. **FN**



## STATE OF THE MOUNTAIN BIRDS

continued from page 1

fallen short to protect the birds of our mountains, we suggest solutions.

So, what is the state of mountain birds? Results provide grounds for both optimism and concern. During the 16 years of MBW coverage, populations of some species have increased, while others have not. Those with the most obvious gains are widespread species like Black-capped Chickadee and Swainson's Thrush, which now occur in more places and in greater numbers than they did when Mountain Birdwatch began. Fox Sparrow, too, has shown an intriguing pattern of increase; although still uncommon in the overall MBW study area, its populations seem to be on the rise as breeding birds spread south.

Species showing the strongest signals of decline, in contrast, are those found only in the high country, notably Blackpoll Warbler. Populations of Bicknell's Thrush, avian icon of the

*Globally, populations of Blackpoll Warbler have declined substantially in the past several decades, suggesting that regional declines documented by Mountain Birdwatch may be related to factors operating throughout the species' migratory range.*



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mountains, have been largely stable, with some evidence of modest declines in recent years.

In some cases, population trends among montane breeding birds of the Northeast seem to reflect broader trends. Global populations of Blackpoll Warbler, for example, have declined substantially in recent decades, suggesting that declines documented by MBW may be related to factors operating throughout the species' migratory range. Possible causes include loss of wintering and/or migration habitat, or systemic effects of global climate change. For other species, population

trends in our region are distinct from broader trends. Swainson's Thrush has declined in many parts of its range, but appears to be thriving in mountains of the Northeast. We can only speculate as to why, although it is worth noting that many climate-change models have predicted species currently inhabiting low- and mid-elevation forests will increase in abundance at higher elevations as they track a warming climate.

This report isn't just about the science and conservation of mountain birds. It also provides a chance to celebrate the hundreds of citizen scientists who each year venture out in the pre-dawn darkness to count birds in montane forests from the Adirondack high peaks to Maine's Mount Katahdin. Their hard work and remarkable commitment allow us to gain much-needed insights into population trends of species like Bicknell's Thrush and Blackpoll Warbler, and into the health of mountain forests on which these birds depend. As we demand more and more from our mountains—as sites to generate renewable energy, as a source for clean water, and as places for recreation—this kind of information will prove increasingly crucial. Keeping mountain ecosystems healthy and productive in the face of climate change and increased use by humans requires science-based solutions, and science-based solutions rely on the sort of data collected under Mountain Birdwatch. **FN**

*Population health for each of ten focal species is based on annual counts by Mountain Birdwatchers.*



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FOR MORE DETAILS ON THESE FINDINGS, PLEASE TAKE A LOOK AT OUR *STATE OF THE MOUNTAIN BIRDS* REPORT, AVAILABLE ONLINE AT [MOUNTAINBIRDS.VTECOSTUDIES.ORG](http://MOUNTAINBIRDS.VTECOSTUDIES.ORG).

*Intern Nate Launer  
with a recently  
banded Dark-eyed  
Junco on  
Mt. Mansfield.*



## A Transformative Intern Experience

**As our second annual Alexander Dickey Conservation Intern, Vermont native Nate Launer's experience provided rich learning and deep connections. | BY NATE LAUNER**

**A**s I watch the leaves begin to fall, radiating with the colors of autumn, I find myself reminiscing about a transformative summer internship, one in which I was immersed in the wilderness of New England.

During my 12-week season as VCE's 2017 Alexander Dickey Conservation Intern, I was given the opportunity to learn about, and help conserve, a natural world that, as a Vermonter, has always deeply rooted me. It is a landscape which provides me great solace, one to which I have become increasingly connected. Some of my most cherished memories include the anticipation felt awakening in pre-dawn darkness atop a remote mountain peak to listen for the nasal calls of a Bicknell's Thrush, the nervous exhilaration of handling a Common Loon for the first time, or the thrill of finding a loon nest while paddling the serene waters of Vermont's lakes.

Through daily field work under VCE's mentorship, I broadened my knowledge of natural history and ecology, gaining invaluable technical skills in the field of wildlife research, finding immense satisfaction in these hands-on experiences. My relief following the exciting, albeit stressful, rescue of a loon badly entangled in fishing line, and transferring it safely to trained rehabilitators in Maine was but one of the many rewards this internship gifted me. Yet, even more gratifying still

was witnessing the genuine interest and appreciation of those who learned of our efforts, and their frequent eagerness to help.

Through this internship, I felt inspired to share my passion for nature and its conservation with the many people I met, and to communicate with them my enthusiasm for this rich learning opportunity. I was pleased to discover that my own commitment and love of nature was already shared by so many

THROUGH DAILY FIELD WORK UNDER VCE'S MENTORSHIP, I BROADENED MY KNOWLEDGE OF NATURAL HISTORY AND ECOLOGY, GAINING INVALUABLE TECHNICAL SKILLS IN THE FIELD OF WILDLIFE RESEARCH, FINDING IMMENSE SATISFACTION IN THESE HANDS-ON EXPERIENCES.

others. I found myself within a community of generous, caring volunteers, local Vermonters and non-residents alike, truly passionate to provide their help, enriching my experience with their stories and good company. This spirit was exemplified by the nurture of a nesting loon pair on Lake Fairlee, where VCE's dedicated volunteers eagerly assisted in the construction of a nesting raft, diligently monitored the pair's progress, and ultimately ensured the nest's success, much to the joy of all. This experience, and many like it, reinforced the internship's most fundamental lesson for me: that conservation is a collaborative process, powered not only by trained researchers and professionals, but by the hearts, minds, and actions of all who share a vision of a healthy natural world.

Upon considering my future as a wildlife conservationist, I know that my ideas and direction have been deeply influenced by my internship with VCE. The skills and knowledge I acquired will be indispensable, but the relationships I built, my personal growth, and the memories I created will endure forever. **FN**



Extensive montane-fir forest as viewed from Mt. Jefferson in White Mountain National Forest, the largest conservator of Bicknell's Thrush habitat in the U.S., which alone supports roughly 31% of the species' U.S. population.



# Estimating Bicknell's Thrush Numbers

**Refining a U.S. population estimate for Bicknell's Thrush to better assess the success of future conservation and management actions.**

BY JASON HILL

**F**or more than 25 years, Bicknell's Thrush has been a centerpiece of VCE's research, which has focused on the species' population ecology and conservation status. Our hard work recently bore important fruit with peer-reviewed publication of the first abundance map and fine-scale U.S. population estimate for Bicknell's Thrush: approximately 71,320 adult birds. This new research, published in the open-access journal *Ecosphere*, also highlights the importance of public lands to conserving Bicknell's Thrush populations. We estimate that more than half of the U.S. Bicknell's Thrush population occurs on just three public tracts: White Mountain National Forest (WMNF) in New Hampshire and Maine, Katahdin in Maine's Baxter State Park, and the High Peaks Wilderness Area in New York's Adirondack State Park (Figure 1). WMNF is the largest conservator of U.S. Bicknell's Thrush habitat, and alone supports approximately 31% of the predicted U.S. population.

These findings have important conservation implications for Bicknell's Thrush, which is one of the most range-restricted bird species in North America. In the U.S., Bicknell's Thrush occurs only in montane spruce-fir forests of New York, Vermont, New Hampshire and Maine. Climate change is expected to substantially diminish this vegetation community (>50% extinction from current range) between 2100-2300. Our research estimates that approximately 95% of the U.S. Bicknell's Thrush population breeds in spruce-fir forests located above 805 meters (2,641 feet) elevation.

This new population estimate was created using cutting-edge statistical models

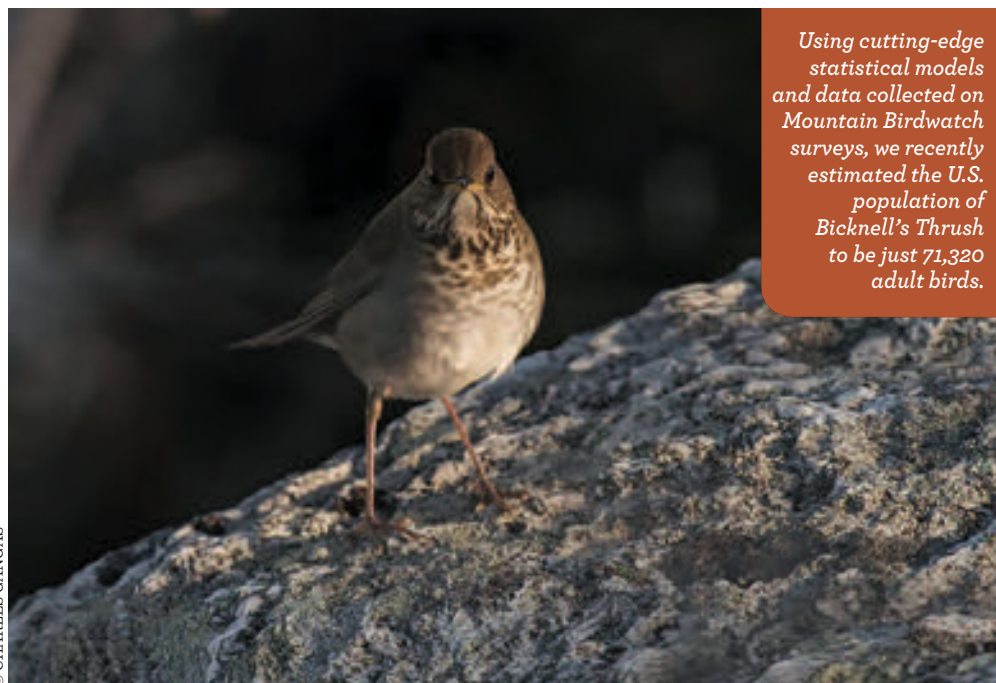


populated with Mountain Birdwatch data (MBW) collected from 2011 to 2016—work that would not have been possible without the tireless efforts of hundreds of MBW citizen scientists. These observers annually count ten montane breeding bird species at nearly 750 points located along mountain hiking trails throughout the U.S. range of Bicknell's Thrush (Figure 2). During these surveys, MBW volunteers conducted no fewer than 14,552 five-minute point counts and tallied 1,079 observations of Bicknell's Thrush!

In order for VCE's statistical models to accurately estimate Bicknell's Thrush abundance and density across the landscape, it is crucial to know where the species does not occur, as well as where it does. Data collected by MBW observers who conducted counts at locations without Bicknell's Thrush were critically important to our model. Only by incorporating data from these locations, combined with count data from occupied habitat, were we able to produce such a precise Bicknell's population estimate for the U.S.

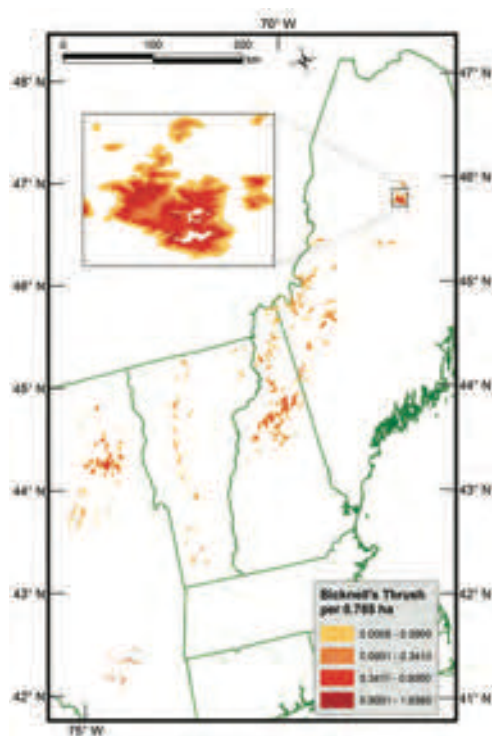
Combining VCE's results with existing estimates of Bicknell's Thrush population size in Canada indicates a global population of fewer than 120,000 birds; suggesting that Bicknell's Thrush likely has one of the smallest population sizes of regularly occurring bird species within the contiguous U.S. and Canada. We predict that our model will provide a testable framework to assess the success of future conservation and management actions on Bicknell's Thrush populations throughout the species' U.S. breeding range.

This new VCE research is freely available online in the journal *Ecosphere* (see 2017 Publications on page 11), and the fine-scale (<1.0 hectare resolution) abundance map can be fully explored at DataBasin.org. **FN**

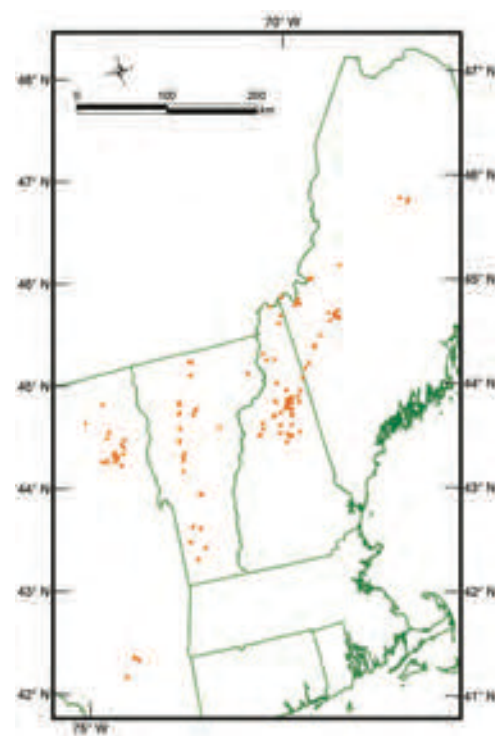


Using cutting-edge statistical models and data collected on Mountain Birdwatch surveys, we recently estimated the U.S. population of Bicknell's Thrush to be just 71,320 adult birds.

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**FIGURE 1: PREDICTED ABUNDANCE OF THE U.S. BICKNELL'S THRUSH POPULATION IN 2016. THE INSET SHOWS THE KATAHDIN AREA OF MAINE.**



**FIGURE 2: THE 747 MOUNTAIN BIRDWATCH SAMPLING LOCATIONS WHERE CITIZEN SCIENTISTS CONDUCTED SURVEYS ACROSS NEW YORK, VERMONT, NEW HAMPSHIRE, AND MAINE.**





Bryan Pfeiffer on one of his many coastal birding adventures.

From Anisoptera to Zonotrichia:

# A Legacy of Science and Conservation

*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.*

BY KENT MCFARLAND

More than 30 years ago, a new birder on the scene in Vermont, **Bryan Pfeiffer**, “made the pilgrimage” to meet Sally Laughlin, the executive director of the Vermont Institute of Natural Science (VINS) in Woodstock. At about that time, Sally hired VINS's first research director, Chris Rimmer, who would go on to become a founder and executive director of VCE. Ever since, Bryan and Chris and VCE have been partners in science and conservation.

For the past three decades, Bryan and every member of the VCE staff have collaborated on a huge range of projects—from the reintroduction of Peregrine Falcons in the 1980s to the launch of a damselfly and dragonfly atlas just this year. With that legacy in mind, VCE has selected Bryan Pfeiffer for the 2017 Julie Nicholson Citizen Science award.

“There are few who have done more to share their passion and knowledge of Vermont's natural history—with such flair and artistry—than Bryan,” says Rimmer. “His keen eye, richly articulate voice, solid understanding of science, and deep commitment to conservation have touched legions of people. Bryan's contributions to science-based conservation run deep and across all levels of society.”

Bryan brings an unusual slate of skills to VCE. He's a writer, editor, educator, birder, photographer, entomologist, and all-around naturalist. Sharing nature with people—in the field or with the force of the written word—is in Bryan's DNA.

Bryan doesn't give it all away for free. He's been a VCE contract employee, most recently helping with VCE's outreach and communications. (Bryan, for example, conceived of Outdoor Radio, VCE's successful collaboration with Vermont Public Radio, and he supervised the overhaul of our website.)

As a volunteer, Bryan's contributions are older than VCE itself. He has surveyed our Forest Bird Monitoring route at Bear Swamp for 27 consecutive years; worked

on the Vermont Breeding Bird Atlas, both outdoors and indoors, including co-authoring the chapter on avian conservation; completed several Mountain Birdwatch routes; and curates dragonfly, damselfly, and butterfly records on the Vermont Atlas of Life iNaturalist project. This year he took the lead with me on the Vermont Damselfly and Dragonfly Atlas, a natural project for Bryan, who had already collaborated with Mike Blust to publish a major journal article on the distribution of these insects in Vermont. And Bryan continues to be a volunteer advisor to VCE on communications and general strategic thinking.

Insects now occupy most of Bryan's time in the field. Having made big contributions to birding in Vermont, Bryan has stepped away a bit from birds, yielding to a new generation of birders, in order to bring more attention to invertebrate discovery and conservation in the state. That means you're more likely to get outside with Bryan with a net in pursuit of butterflies or dragonflies.

“So much of what we love about birds—flight, color, grace, and beauty—we also find in flying insects,” Bryan says.

And unlike insects, there will be no diapause for Bryan this winter. On his agenda is a field guide to Vermont tiger beetles, along with more work on the Vermont Damselfly and Dragonfly Atlas.

We've learned that there is indeed one thing that can slow this guy down: a heart attack. Bryan had one while out on the trail in August, only days after we informed him of this award. But he's up and around, recovering, and even out swinging a net in his backyard garden at home in Montpelier and a bit farther afield. “I can't let a heart attack keep me from tagging Monarchs this fall,” said Bryan, who's had four of his tagged Monarchs recovered in Mexico.

Although Bryan's passion for the natural world is often centered in Vermont, his impact reaches far afield. **FN**



## SELECTED PUBLICATIONS



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# FIELD NOTES

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## Eastern Pearlshell {*Margaritifera margaritifera*}

### Precious freshwater mussels native to the northeastern U.S.

BY LYRA BRENNAN



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Top: Listed as "Threatened" in Vermont, Eastern Pearlshell mussels prefer gravel-laden river bottoms in small, cold streams.

Bottom: Eastern Pearlshell are known for producing high quality pearls with the same iridescent, smooth surface as seen on their inner shell.

**A**mong the list of the longest-lived animals on earth, a small, dark-shelled aquatic creature is tucked amongst the Bowhead Whale and Galapagos Giant Tortoise. Eastern Pearlshell (*Margaritifera margaritifera*), a freshwater mussel native to the northeastern U.S., has a recorded maximum life span of 132 years and a potential maximum age of 167 years. It is one of the only North American freshwater mussel species with a range that extends into northern Europe, and it is the only bivalve—or two-shelled mollusc—from the family Margaritiferidae native to Vermont.

Eastern Pearlshell are easy to miss when you're not underwater, which suits their purposes quite well. Like most freshwater mussels, they spend their entire lives in one location, and it takes enormous energy for them to resuscitate themselves once disturbed. This species in particular will let you know that it's unhappy when out-of-water, sputtering and wheezing if removed from its home. Pearlshell prefer to nestle their curiously elongate, sometimes banana-shaped shells between the rocks of gravel-laden river bottoms in small, cold streams.

*Margarita*, for pearl, and *fera*, for bear, translates this mollusc's Latin name to "pearl bearer." When a microscopic intruder, like a parasite, enters a bivalve, the animal will form a sac around the invader and secrete calcium along with a shell-forming substance called conchiolin. This process coats the unwelcome guest,

creating a pearl with the same iridescent, smooth surface as the inner shell of the mussel. Eastern Pearlshell were historically renowned for producing high quality pearls, and were likely exploited for this gem-forming defense mechanism.

But don't judge this species' value on potential pearls alone. Rather, admire the pearlshell for the key role it plays in freshwater ecosystems, filtering out nutrients and detritus, and providing biomass in rivers and lakes. Eastern Pearlshell are extraordinarily productive, and females can release up to 17 million glochidia, or tiny juvenile mussels, annually. If there aren't sufficient males to fertilize young, pearlshell have the ability to become hermaphroditic and self-fertilize in dire conditions. Juvenile mussels depend on attaching to host fish for their development/growth, and Eastern Pearlshell only attach to salmonid species, including Rainbow and Brook trout, and Atlantic Salmon.

Eastern Pearlshell react poorly to changes in water temperature, flow, and chemistry. Owing to high sedimentation, altered pH levels, and warmer waters, they are not only rare, but also listed as "Threatened" in Vermont. For freshwater mussels, being rare is paradoxically common, and almost half of Vermont's native species are at-risk. Still, when the waterline is low and the sun is high, you just might discover the empty shell of a pearl-maker. **FN**