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Vermont

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Vermont Fish & Wildlife Department
Agency of Natural Resources

Conserving Vermont's fish, wildlife, and plants and their habitats for the people of Vermont

Nature's Resilience (And Ours)

By Roz Renfrew, Wildlife Diversity Program Manager

Every Vermonter reading this knows why, in 2023, “resilience” became a household word. On the brink of being overused, the word now serves as a visionary goal across a broad range of topics, including health, communities, infrastructure, and of course climate change.

Essential to these pursuits is resilience of nature. Piles of research confirm that we absolutely need the “services” of functioning natural systems for our own survival via flood attenuation, sustainable food production, carbon sequestration, and mental health, to name a few. Vermont has a long tradition of placing high value on many of these benefits of nature, along with its inherent value, and giving it a seat at the table. In reality, it is the table, and it serves up a smorgasbord.

A human pyramid falls apart when the lower tiers tire out, and so too is the way of ecosystems. Losing parts will eventually cause a collapse. But unlike the pyramid, each piece of nature is unique and not easily substituted, particularly specialists- species that are highly adapted and perform very specific functions.

Evolution once took care of adjusting species to changing climates as glaciers advanced and retreated. In the face of climate change, we no longer have the luxury of operating at glacial speed. Inescapably, we have entered an era that requires we manage land and water with an eye towards future conditions, anticipating changes rather than trying to return to some prior condition.

Holding on to every piece is the path to resisting collapse. The collection of those pieces of nature - biodiversity - bestows resilience. The more that the myriad forms of life remain intact and functioning together, the better we will weather hazardous events and changes of a magnitude we can only imagine.

In this issue we feature a sampling of ways Fish & Wildlife's Diversity Program is holding on tight to Vermont's biological diversity and building resilience, including maintaining connected landscapes, stabilizing declining populations, preventing disease and more. Like an ecosystem, we all have a part to play, and functioning together, we will create resilience.



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Healthy, Intact Wetlands Make the Vermont Landscape More Resilient

By Dan Farrell

Flooded wetlands were a common sight for Wildlife Diversity Program staff after the record rainfall in the summer of 2023. One day in late July, our boots hopelessly overtopped as Grace Glynn (State Botanist) and I were obliged to identify plants beneath hip-deep water. We were in an Intermediate Fen in East Montpelier, a functioning wetland that had slowed the flow of excess water. Had it not been for the fen, the water would have rushed into a brook and down to the Winooski River, sending even more water to towns that washed out roads, flooded buildings, and eroded river channels.

The importance of water storage in wetlands is well understood. An influential study by Keri Watson (Gund Institute, University of Vermont) demonstrated this in Middlebury, where Otter Creek floodplain forests protected the town from flooding during Hurricane Irene.

Flood attenuation is only one of the ways that healthy wetlands confer resilience. Wetlands reduce the effects of drought and help to control erosion by slowly releasing stored water over time. They improve water quality by transforming and attenuating pollutants like phosphorus from surface waters. Water from wetlands fed by cool groundwater- like seepage forests and swamps, riverside seeps, and some fens- creates cool zones in streams. These “thermal refugia” help aquatic species like brook trout that depend on cool, oxygen-rich water. Vermont wetlands may also become “climate refugia” by creating micro-climates that buffer the effects of climate change.

Less disturbed wetland natural communities are more resilient than those in poor condition. Older forested swamps, for example, with many native species and abundant downed woody debris, well-buffered by intact forests, are most viable. Disturbed swamps, however, are full of invasive species, lack structural diversity, and are bordered by developed areas rather than buffering habitat.

The Wildlife Diversity Program was well-prepared to assess wetlands during the summer of '23, thanks in part to an EPA Wetland Development Grant. Our work to discover, document, and conserve high-quality wetlands protects a great diversity of plants and animals, helping to ensure that Vermont's landscape retains the benefits of resilience.



Botanist Grace Glynn



Flooded Intermediate Fen



Community Ecologist Bob Zaino

VFWD

Resiliency Through Recovery– Meadowlarks and Whip-poor-wills

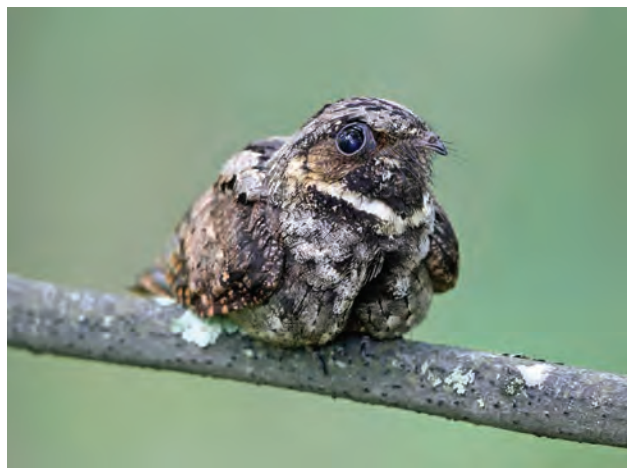
By Jill Kilborn, Nongame Bird Project Leader

Adding a species to an endangered species list is a beginning, not an end, meant to spur action to do something about a species in peril. When a species is listed as state threatened or endangered in Vermont, oftentimes the next step is to develop a “recovery plan”, replete with strategies to halt population declines, reduce threats, and ultimately, stabilize or even increase populations.

Eastern Meadowlark and Eastern Whip-poor-will have experienced significant population declines in the state and elsewhere in their ranges. After their listing, Wildlife Diversity Program staff partnered with Vermont Center for Ecostudies to develop recovery plans. A steering wheel for the road to recovery, each plan highlights current knowledge, identifies information gaps, establishes population recovery goals and lays out actions to achieve them.

Eastern Meadowlark is one of a suite of species that depends wholly on grasslands. These birds have experienced the steepest of bird population declines. Vermont sits on the eastern edge of the meadowlark’s range, and most of the state’s population resides in the Champlain Valley’s agricultural landscapes. Habitat loss and conversion, and intensification of land management practices are primary drivers of population losses, and invasive plants degrade habitat. Under the plan, Vermont Fish and Wildlife is setting out to improve grassland bird habitat on select Wildlife Management Areas. Actions include mitigating the impacts of invasive plants and working with farmers to find opportunities that allow meadowlarks to nest.

Continued on page 7.



*Eastern Whip-poor-will (above)
Eastern Meadowlark (below)*



Sue Young & Tom Murray (CC)



Every little thing they do is magic.

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Look for the check-off on your Vermont income tax form or donate online at: vtfishandwildlife.com/nongame-wildlife-fund.

Wildlife Diversity Highlights - Supported With Help From Vermont

Your donation to the Nongame Wildlife Fund helps the future of Vermont's wild animals and wild places, protecting everything from year! We leverage your donation for additional federal funds, so one dollar to the Nongame Wildlife F



Supporting Native Pollinators

During the spring and summer of 2023, the Vermont Fish & Wildlife Department partnered with Caledonia Spirits and Bee The Change to install three demonstration gardens at the Montpelier distillery. The gardens highlight how Vermonters can create spaces for native plants and pollinators in their own backyards. Additionally, a 1/3-acre area at the entrance of the distillery was tilled and planted with a cover crop in preparation to be planted this spring. Our Botanist worked closely with Caledonia Spirits to craft a species list of native plants—such as little bluestem and wild beebalm—that support native pollinators. Educational signage was installed to inform visitors about the project and Fish & Wildlife's focus on native biodiversity.

Building Resiliency for a Federally-Endangered Rivershore Plant

Jesup's milk vetch (*Astragalus robbinsii* var. *jesupii*) is known from only three sites worldwide, all of which are on outcrops along the Connecticut River. In 2023, botanists with the Fish & Wildlife Department, the Native Plant Trust, and the New Hampshire Natural Heritage Bureau continued efforts to introduce two populations upstream of Wilder Dam. Because all three natural sites are located below the dam, this introduction effort will increase the likelihood of long-term survival of the species by establishing additional populations, while also reducing the risk that a catastrophic event will impact all populations at once. Both of the introduced sites show promising rates of transplant survival, and monitoring in 2024 will shed light on how these populations fare following extreme summer flood events.



Spiny Softshell Turtles Weather Historic Floods

Female Spiny Softshell Turtles nest on just a handful of small beaches along Lake Champlain. The heavy rains in July 2023 caused the lake to rise by about 2 1/2 feet, at a time of year when normally levels are dropping. The flooding corresponded with the end of the nesting season for Spiny Softshell Turtles. Some newly deposited nests were flooded, drowning the eggs. At two monitored beaches all nests were destroyed and at a third beach site, nearly all nests were lost. Fortunately, the fourth and only remaining monitored beach was high enough to keep the rising waters from reaching the nests, and the turtles hatched successfully. Fish & Wildlife maintains multiple nest beaches to provide space for turtle nests and to avoid putting all eggs in one basket. The 2023 floods provide a prime example of why, more than ever, resiliency for wildlife requires conservation of multiple populations.

nt's Nongame Wildlife Fund

From yellow-banded bumblebees to American martens. Many thanks to all our supporters who donate each life Fund can yield two to three dollars more for conservation in Vermont.



How to Think Like a Bat ↻

We trained nearly 100 people to think like a bat over the past year! After an introduction to the biology of Vermont's nine bat species, we walked through the woods to explore bat habitat features. From microhabitat like tree cavities and bark to roost in, to macrohabitat such as freshwater and forest edges to forage along, we highlighted similarities shared among species as well as the specific habitat niches they each fill. For example, the state threatened Eastern Small-footed Bat roosts exclusively in rocky habitat. Foresters, loggers, biologists, landowners, and land use planners learned to see the landscape from a bat's perspective. With this knowledge, they can best manage lands to benefit bats, such as retaining large cavity trees for roosting and promoting native plants that support a larger variety of flying insects for bats.



Eastern small-footed bat

USFWS



Mudpuppy

Kiley Briggs

Assisting Snakes and Mudpuppies ↻

To prevent harm to both snakes and humans, Fish & Wildlife pairs concerned landowners with trained snake handlers to move Timber Rattlesnakes and Eastern Ratsnakes off of private properties. Landowners can contact a handler who will safely capture the snake and release it unharmed at an appropriate location. Over the past five years, 32 Timber Rattlesnakes and Eastern Ratsnakes were safely relocated. In 2020, we initiated a project to capture and relocate Mudpuppies within the Lamoille River for a very different reason: to establish an additional upstream population, increase abundance, and create a haven ("refugium"), all to enhance long-term resilience for the species in Vermont. Over 170 Mudpuppies were relocated, with a subset receiving radio transmitters that allowed us to track their movements following release.

The Power of the Natural Heritage Database ↻

In 2023 we continued to make strides towards a comprehensive statewide checklist of animals in the Database. We added 91 bee species and revised State Conservation Ranks for 242 bee species, thanks to a review by Vermont Center for Ecostudies (VCE) - a significant advance in Vermont's biodiversity documentation. We also added species occurrence data from many sources; VCE's Eastern Meadowlark surveys, GBIF's bumble bee records, and Native Plant Trust's volunteer plant monitoring data. Including data from so many sources and collaborating with partners results in a robust understanding of biodiversity in Vermont. Each year the Natural Heritage Database informs research, species and land conservation, responsible land use and management, and regulations. It also proactively helps balance development with the preservation of species and their habitat. For example, impacts to 11 rare and listed species were avoided recently in a single transmission line upgrade; similar scenarios play out several dozen times in a given year.



Rue Anemone

Joshua Morse

Reptile and Amphibian Diseases: Small Size, Big Impacts

By Luke Groff, F & W Herpetologist

One of the major challenges facing reptile and amphibian resiliency is pathogens and the diseases they cause. Pathogens include viruses, bacteria, fungi, and parasites, and many can readily spread between animals and across landscapes. Often not even visible to humans, pathogens can have outsized impacts on wildlife populations.

Some diseases can decimate populations and even cause extinctions. For example, some strains of ranavirus (the only genus of virus that infects frogs) cause 90–100% mortality, and are responsible for some amphibian mass mortality events. Chytridiomycosis is an infectious disease caused by certain (“chytrid”) fungi. The amphibian chytrid fungus *Batrachochytrium dendrobatidis* (Bd) has contributed to the extinction of at least 90 species, and population declines of hundreds more. *Batrachochytrium salamandrivorans*, another chytrid fungus, has not yet been detected in North America but will significantly impact salamander populations if it arrives.

Reptile and amphibian diseases are not always lethal but they can still be harmful. Sublethal effects include reduced mobility, decreased reproductive success, suppressed immunity, and impaired thermoregulation, which may still lead to death through interactions with other threats. For example, the parasitic Frog-mutating Flatworm causes malformed frogs with missing,



Eastern Newts are susceptible to pathogens.

deformed, or extra limbs. Small, isolated snake populations that lack genetic diversity may suffer from unusually high mortality rates when infected with the fungus *Ophidiomyces ophidiicola* (Oo), which causes snake fungal disease.

In Vermont, we have documented the presence and witnessed the effects of ranavirus, Bd, and Oo. Fortunately, new research has improved our ability to combat diseases by advancing our understanding of them, identifying at-risk species, refining detection methods, creating response plans, and developing preventive and treatment strategies - all steps in finding a path to resilience.

You can help safeguard reptiles and amphibians too!

- Properly disinfect footwear, waders, and field gear before entering aquatic habitats.
- Be vigilant and quickly report mortality events to Vermont Fish and Wildlife.
- Think thoughtfully about the pets you keep. Diseases have spread across states, countries, and continents through the pet trade.
- Consider alleviating other threats by improving habitats, helping reptiles and amphibians cross roads, keeping your pets leashed, and donating to your favorite conservation organization.



Restoring Lake Champlain's Remnant Sand Dunes

By Grace Glynn, F & W Botanist

The globally rare Champlain beachgrass (*Ammophila breviligulata* ssp. *champlainensis*) has persisted on Vermont's windblown sand dunes since the Champlain Sea occupied the basin around 10,000 years ago. This subspecies—distinct from the coastal beachgrass—is found in only two locations in the state. Just as some plants are adapted to fire and others to floods, Champlain beachgrass relies on shifting sands to persist. At Alburgh Dunes State Park, efforts are underway to restore natural processes to the state's largest dune system, which supports our largest population of Champlain beachgrass.

With generous funding from the Cotyledon Fund, Fish & Wildlife partnered with Native Plant Trust last year to install 375' of split-rail fencing to prevent foot traffic on the park's dunes. It replaced the old snow fencing, which had accumulated debris at its base and prevented the movement of sand from the beach onto the dunes. Without this process of sand movement and deposition, the dune was becoming overrun with woody plants and invasive species such as knapweed. To restore natural processes to the dunes, we chose an open-bottomed fence that will allow sand to freely shift as it has done for 10,000 years.

Fish & Wildlife and Native Plant Trust also transplanted Champlain beachgrass plants from the population at Alburgh Dunes State Park to two nearby dunes where the species had been wiped out by Hurricane Irene. Establishment of the beachgrass was closely monitored and >70% of transplants were alive and growing through 2023. Because beachgrass is a sand-binder and dune-builder, the plants themselves will restore this rare natural community as they take hold, providing habitat for other rare species, such as the hairy-necked tiger beetle.

Naturally functioning ecosystems are inherently more resilient. The restoration of natural dune-forming processes at Alburgh will likely help Vermont's largest sand dunes to persist through extreme weather events (such as summer flooding) and continue to tell the story of a long-gone post-glacial sea.



Grace Glynn

Interpretive signage at Alburgh Dunes State Park highlighting the importance of restoring Champlain beachgrass.

Resiliency *(continued from page 3)*

Eastern Whip-poor-wills belong to a suite of species that eat insects while flying- aerial insectivores. They forage for moths in open areas near dawn and dusk and at night, and are most active on calm, clear moonlit nights. They sing their name, often serenading in the still quiet hours of darkness. They nest on the floors of forests with dry, nutrient-poor soils. The decline of whip-poor-wills is a bit of a mystery, but the recovery plan cites the limited amount of the forest-field mosaic with suitable habitat conditions and a decline in insect availability as possible limiting factors.

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Comings and Goings

By Roz Renfrew



Our Wildlife Diversity Program welcomed three new talents in 2023. Grace Glynn joined us as Vermont's second state botanist, following Bob Popp's retirement. Although Bob left the proverbial big shoes to fill, Grace has readily taken on this important position and its great

responsibilities with...well, you know. Hailing from Maine and a graduate of UVM's Field Naturalist Program, Grace brought her passion for plants and experience teaching and consulting, and launched right in. She considers this her dream job, and we are equally fortunate! Meanwhile we are enormously grateful to Bob for providing support on his own time, ensuring a smooth transition.

We're so fortunate to welcome Jill Kilborn as our new Bird Biologist. Jill crossed the river after working for NH Fish & Game for 22 years, and brings her breadth and depth of knowledge and skills that are required for this position. After

obtaining her Masters in Wildlife Conservation, her work has spanned both bird and mammals, including bird research, monitoring, and habitat management for Bicknell's thrush, cliff swallows, raptors, and more. Her experience includes recommending state and federally listed species and implementing species recovery plans. Jill brings thoughtfulness, knowledge and wisdom into the myriad responsibilities of the Bird Biologist.



Jill Kilborn

Rounding out our superb newcomers is Molly Parren, soon to join us for a second year as a seasonal biologist. Molly returned to her hometown in Vermont after receiving her Master's degree in Natural Resources and Wildlife, and we snapped her up. Longtime followers of this newsletter may think they're having a déjà vu. Molly's father Steve Parren managed the Diversity Program for over 30 years. Molly shines all on her own though, and we're very fortunate to benefit from her expertise on snakes, mudpuppies, and vernal pools.



Molly Parren