

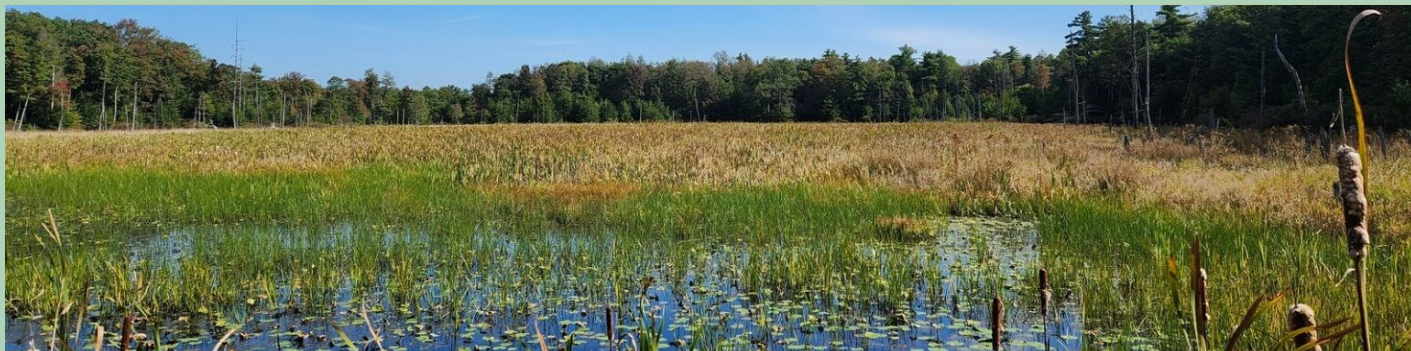


Pennsylvania Natural Heritage Program

information for the conservation of biodiversity

WILD HERITAGE NEWS

Summer 2024



Inside This Issue

Partners and Priorities in Invasive Species	1
The Allegheny River's Aquatic Mushroom	8
Forty Plus Years of Monitoring of <i>Marshallia pulchra</i> on the Youghiogheny River	9
Deer Lakes Park Ecological Assessment	10
Evening Grosbeak Migratory Connectivity Study Expands Westward	11
Four County Work Begins!	13
Wrangling Data for Invertebrate Conservation	13
Wetland Assessments on State Lands	14
Insights from Monitoring two Globally Rare Plant Species	15
Joining the Team and Jumping Right In!	16
It Pays to Keep Looking	17

Photo Banner
Rosecrans Bog
Brian Daggs

Partners and Priorities in Invasive Species Management

by

Brian Daggs, Invasive Species Ecologist

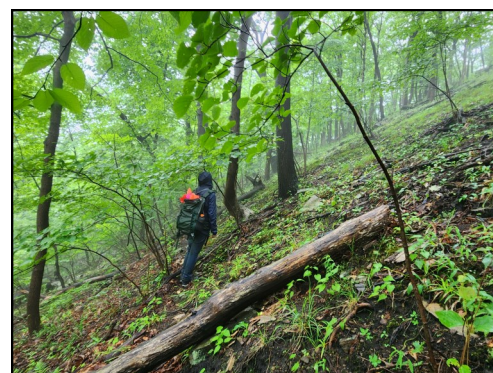
Jessica McPherson, Senior Botanist

Claire Ciafre, Ecologist

PNHP is a program that focuses on rare and unique plants, animals, and natural communities across the state. However, in recent years we could not ignore the ubiquitous threat that invasive species pose to the resources that we want so much to see conserved. It is a huge issue that conservation groups, agencies, and anyone who owns property ultimately has to face. PNHP is devoting more effort to evaluating the threat of invasive species and we are getting some help. PNHP partner, WPC, received a grant from the Richard King Mellon Foundation (RKMF) to work with various partners around the state to assess and monitor invasive plants through focal sites that support significant ecosystems, including threatened habitats and populations of rare plant species.

The project focused on ten sites for assessment. Choosing only ten locations from dozens upon dozens of possibilities was no small task. PNHP staff utilized geospatial analysis to overlay multiple datasets and narrow the list of candidate sites. Two datasets, the Natural Heritage

Areas Inventory (NHAs) and the Pennsylvania Botany Priorities, became the primary base layers to define potential sites. NHAs consist of almost 4,000 designated places that support rare plants, animals, and natural communities. The Pennsylvania Botany Priorities is a tool used internally by PNHP to prioritize and guide conservation planning, stewardship, and management by ranking each potential botany target site. This ranking is based on the global irreplaceability and local rarity of its constituent species, the quality and uniqueness of the habitat, and the degree

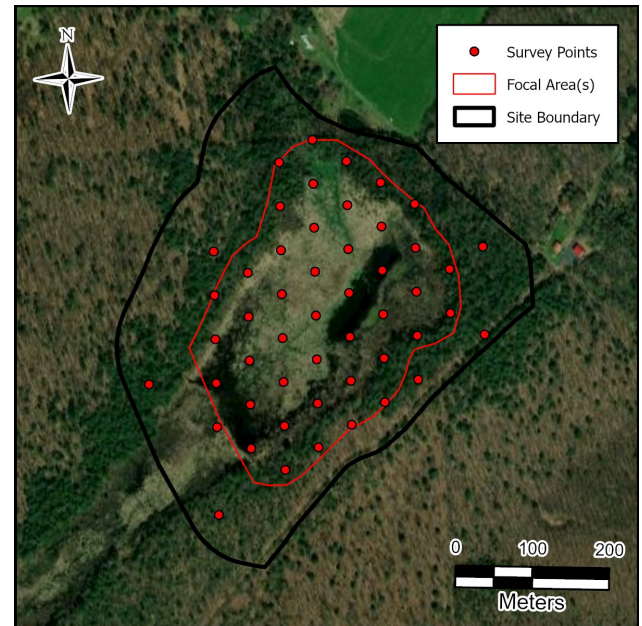


Jessica McPherson, PNHP senior botanist, at Birmingham Slopes

Brian Daggs

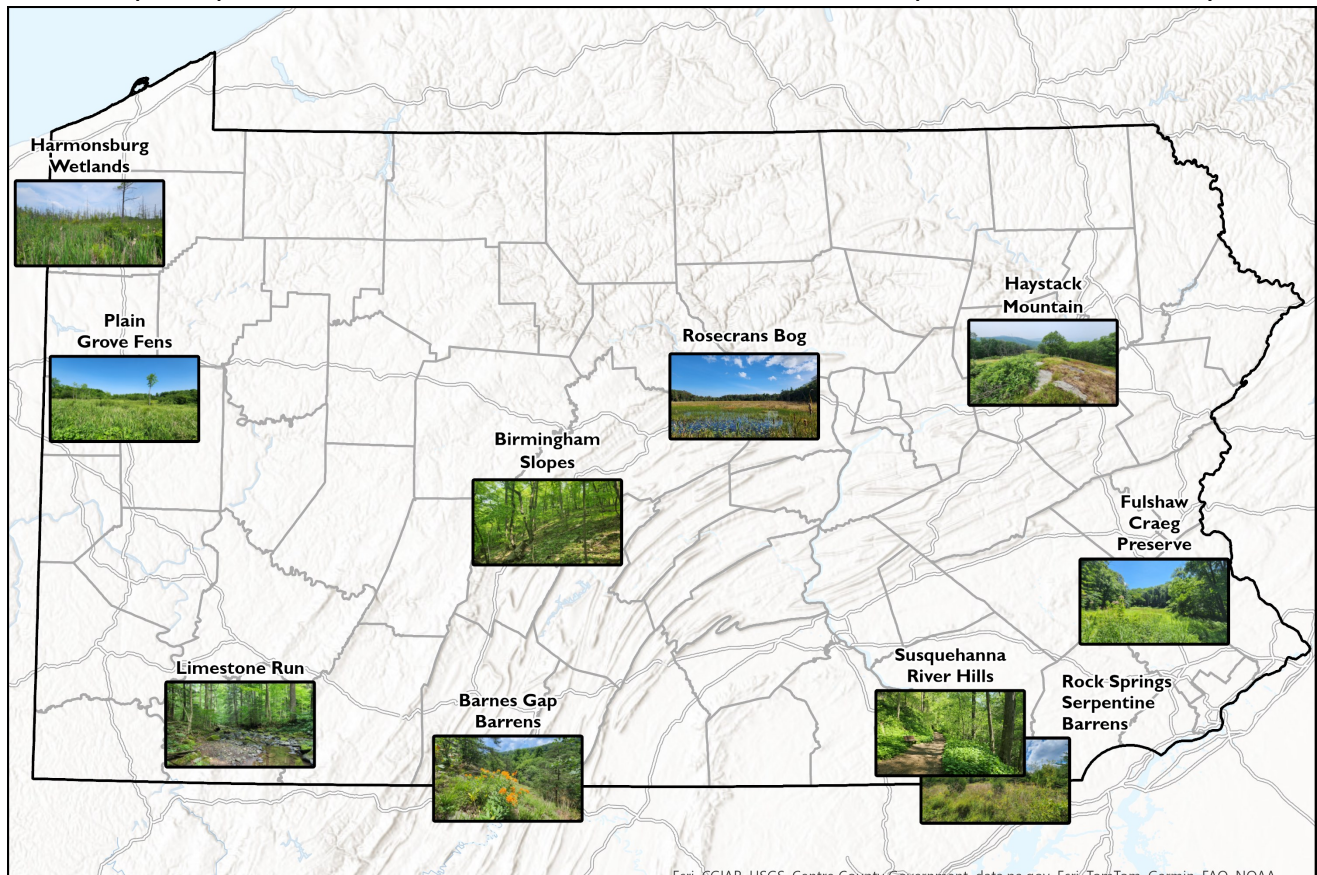
of conservation action support the site receives. All sites selected for this project were in Natural Heritage Areas and had high Pennsylvania Botany Priorities ranks. We utilized other information to pare down the sites into a manageable number including PNHP's [climate change connectivity analysis](#), and overlap with areas designated as high-priority in the [Western Pennsylvania Business Plan for Restoration of Healthy Forests and Freshwater Habitat](#) including regions such as the French Creek watershed, the Laurel Highlands, and the Pennsylvania Wilds. We also wanted to represent the six regions outlined in the [proposed Partnerships for Regional Invasive Species Management](#) system, or PRISMs, developed by the Pennsylvania Invasive Species Council.

After this lengthy analysis, PNHP staff chose ten final sites. These sites are spread throughout Pennsylvania and represent a variety of ecosystems, each with its own challenges and invasive species threats. From rich peatlands to acidic barrens, these sites serve as a sampler of Pennsylvania's unique biodiversity. The first step was an on-the-ground assessment which we accomplished systematically by surveying at grid points (coordinates) mapped over the sites. At each point we collected data on invasive species presence, cover, and distribution.



Point-grid survey structure at Rosecrans Bog.

Overall, PNHP staff documented nearly 100 different species of invasive plants and a few invasive invertebrates during surveys for this project, adding over 2,000 records to the iMapInvasives database. Many of these



Map of the ten sites assessed by PNHP staff for invasive plant populations.

Assessment Site Locations



Barnes Gap Barrens



Birmingham Slopes



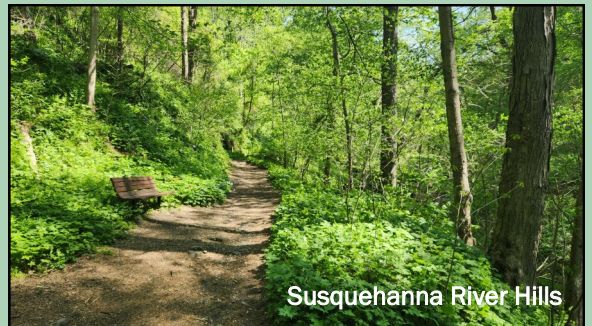
Rosecrans Bog



Rock Springs Serpentine Barrens



Limestone Run



Susquehanna River Hills



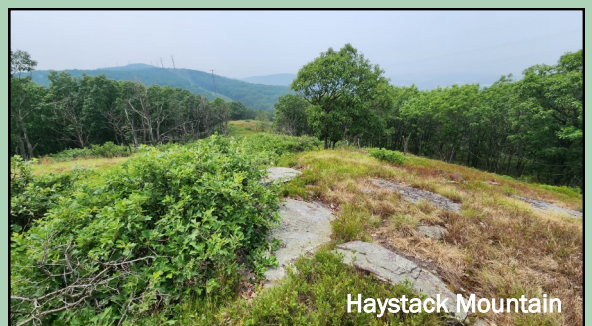
Fulshaw Craig Preserve



Plain Grove Fens



Harmonsbury Wetland



Haystack Mountain

species, such as multiflora rose (*Rosa multiflora*), common reed (*Phragmites australis* ssp. *australis*), Japanese barberry (*Berberis thunbergii*), garlic mustard (*Alliaria petiolata*) and Japanese stiltgrass (*Microstegium vimineum*), are well-known invasives that are common throughout the state. Other species found, however, are lesser-known threats. These include species that may be long-established but geographically limited such as princess tree (*Paulownia tomentosa*), habitat specialists that are only invasive in certain contexts such as barren brome (*Bromus sterilis*), or new and emerging invasive



Himalayan smartweed at Susquehanna River Hills

plants like creeping Himalayan smartweed (*Persicaria posumbu*). While invasive plants were the focus of the project, many noteworthy and harmful invasive invertebrates were also found at several sites, including hemlock woolly adelgid (*Adelges tsugae*) and jumping worms (*Amyntas-Metaphire* spp.).

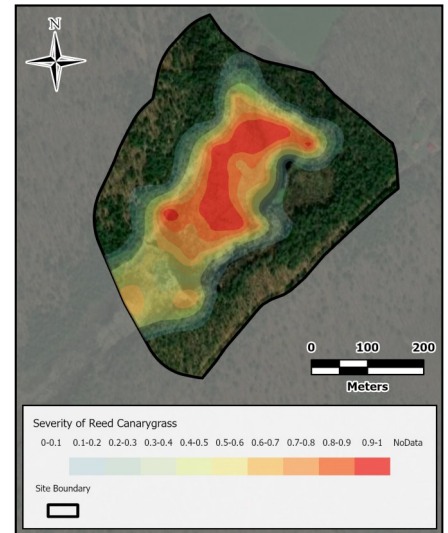
We also found previously-unknown populations of rare species during surveys as well. These include uncommon plants like Nuttall's milkwort (*Polygala nuttallii*) and white alumroot (*Heuchera alba*), and invertebrates like the globally-vulnerable northern metalmark butterfly (*Calephelis borealis*).



Northern metalmark butterfly

Claire Ciafre

After surveys were completed, PNHP staff processed the data and produced maps that show the severity of invasive species cover and density across the site. Using this information, PNHP staff were able to determine each species' status as either a newly-arrived pioneer, an emerging threat, an established population, or a pervasive issue at each site.



Heat map of the severity of reed canarygrass at Rosecrans Bog.

With this data and information, PNHP staff developed monitoring strategies and management recommendations for each site aimed at early detection of new invasive species, and tracking and suppressing the spread of emerging threats. Early detection and monitoring in these areas are critical for protecting the biodiversity and rare species. PNHP staff are working with partners to get this monitoring underway so that land managers and stakeholders can use the information to manage these ecologically-rich places.

PNHP staff have since revisited several sites with the respective stakeholders and partners to show them the findings, teach identification of invasive plant species, and discuss next steps for the sites. Several sites already have invasive plant management planned or in progress in response to the invasive species data collected by PNHP staff. Training materials are also being developed for volunteer monitors from the Pennsylvania Master Naturalists program who will continue collecting valuable data on invasive species at these sites.

In addition to the ten site assessments, PNHP staff also worked on tools for partners to use in managing invasive species. In collaboration with NatureServe, the New York Natural Heritage Program, and graduate students at Cornell University, PNHP staff helped to develop an invasive species management prioritization model for Pennsylvania based on an existing model for New York. This model will be integrated into the

[iMapInvasives web map](#), providing management recommendations per species based on invasive species data aggregated from iMapInvasives, U.S. Geological Survey Nonindigenous Aquatic Species, and iNaturalist. Several invasive species risk assessments were also completed by PNHP staff. Risk assessments weigh the existing evidence of an invasive species' impacts and distribution to determine a score, which entities such as the Controlled Plant and Noxious Weeds Committee can use to decide whether a species should be added to the [PA controlled plants and noxious weeds list](#).

We evaluated these 10 sites because they are among the most important places in the state for one or more rare species and communities. There are many, many more that deserve such attention. But we accomplished more than just documenting invasive species – we checked on the rare species that were the focus of these sites in the first place and maybe most importantly, established strong ties with numerous conservation partners. These partnerships will be the key to protecting the long-term health of these sites and conserving the species in them. And as we all know, friends and partners make a lot of things easier and more possible.

Site Highlight: Susquehanna River Hills



Lobed spleenwort

Claire Clafre



White trout lily

Brian Daggs

The Susquehanna River Hills in Lancaster County were selected for assessment in part because they host a rich assortment of spring wildflowers and several rare plant species, such as hybrid trillium (*Trillium erectum* x *flexipes*), white trout-lily (*Erythronium albidum*), and lobed spleenwort (*Asplenium pinnatifidum*).

These sites are additionally important because of their position adjacent to the Lower Susquehanna River, which is an important migratory corridor and high



Rock outcrops at Tucquan Glen

Brian Daggs

priority area for climate change connectivity. The ravines provide critical forests, outcrops, and riparian habitats to migrating species; however, their connectivity and rich soil puts these places at risk of invasion by nonnative species. Three ravines were assessed; these were within Shenks Ferry Wildflower Preserve, Clark Nature Preserve, and Tucquan Glen Nature Preserve. These preserves are owned and managed by the [Lancaster Conservancy](#), who are excellent land stewards and conservation partners, which was another factor in the selection of these sites for assessment.



Dense mat of roundleaf bittersweet at Shenks Ferry

Brian Daggs

PNHP staff found sixty-three invasive species across the three Susquehanna River Hills sites. Some of the most impactful species we found were vines such as Japanese honeysuckle (*Lonicera japonica*), roundleaf bittersweet (*Celastrus orbiculatus*), and mile-a-minute (*Persicaria perfoliata*). The vines of these species form thick mats which smother native vegetation and can affect all forest strata from the ground flora to the overstory. Hardy kiwi-vine (*Actinidia arguta*) was also found at one of the sites; this species is notable because it is an

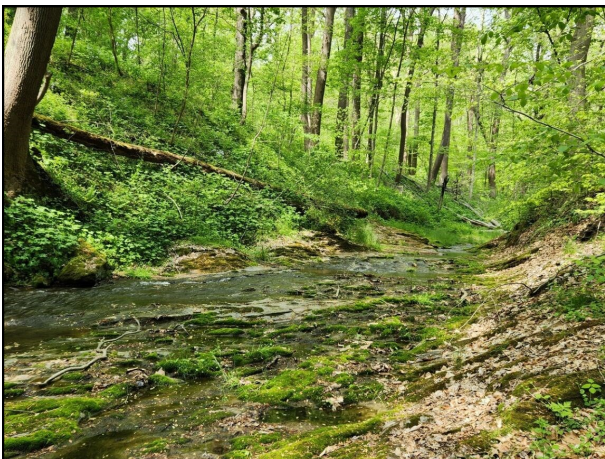
emerging invasive species in the Northeastern United States and has been seldom documented escaping cultivation until recently. Invasive shrubs also were prevalent at each of the three sites, and included Amur honeysuckle (*Lonicera maackii*), multiflora rose (*Rosa multiflora*), and wineberry (*Rubus phoenicolasius*). Each of the mentioned species produce brightly-colored berries eaten by birds. Early detection and strategic management are critical for such species before they become established because they can show up anywhere a bird chooses to “deposit” their seeds.



Brian Daggs

Slope covered in native wildflowers at Shenks Ferry Wildflower Preserve.

PNHP’s recommendations for invasive species management recommendations vary widely between the three sites because of differences in severity and use. For example, the ravine at Clark Nature Preserve is in much poorer condition than the other two sites and consequently is difficult to prioritize specific invasive species or areas for treatment. The highest priorities for the other two sites are species which are present but not yet established at each of the sites. At Shenks Ferry Wildflower Preserve, this includes



Brian Daggs

Grubb Run at Shenks Ferry Wildflower Preserve.

focusing on species spreading along the trails, and a contingent of volunteers are already helping with this effort. Species spreading along the floodplain of the creeks at both Shenks Ferry and Tucquan Glen Preserves are also a high priority. These recommendations will augment the Lancaster Conservancy’s existing management efforts which include targeted herbicide applications by internal staff and organized volunteer invasive plant pulls in critical wildflower habitats.

Site Highlight: Harmonsburg Wetland

Harmonsburg Wetland, once known as Brown’s Cranberry Bog, is a high priority botany site in the glaciated portion of northwestern Pennsylvania. A mosaic of wetland habitats, it features rich fen, shrub swamp, marsh, swamp forest, and acidic bog-like conditions, all within a single glacial wetland complex. It hosts a large number of plant species of special concern.

Peat-accumulating wetlands (peatlands) have high ecological value because they offer habitat to a variety of specialist plants and animals, and because they are essentially irreplaceable due to the long timescale required for peat soil formation. In Pennsylvania, peatlands are rare outside of the glaciated regions of the state; few remain in good condition in the northwest.



Brian Daggs

Portion of Harmonsburg Wetland that was originally a fen, now overtaken by common reed, royal fern, and shrubs.

Portions of the wetland are fed by calcareous groundwater, creating rich fen habitat. Rich fens are uncommon habitats in Pennsylvania, and host an extraordinary diversity of plant species, including some habitat specialists. In advanced stages of development, calcareous peatlands can host specialist plants that require both very high and very low pH. At Harmonsburg, calciphile plants such as alder-leaved

buckthorn (*Rhamnus alnifolia*) grow in groundwater-saturated hollows, while peatland acidophiles such as round-leaved sundew (*Drosera rotundifolia*) and large-leaved cranberry (*Vaccinium macrocarpon*) grow right next them on the tops of peaty hummocks.



Round-leaved sundew

Brian Daggs

The [French Creek Valley Conservancy](#) (FCVC) recently purchased a large portion of Harmonsburg Wetland. FCVC staff is collaborating with PNHP to protect and improve the ecological conditions at the site. Challenges include invasive species, nutrient runoff management, and water level management.

When Jim Bissell of the Cleveland Museum and PNHP staff first visited in the 1990s, there was a large area of open fen vegetation dominated by sedges, grasses, and herbaceous plants. Many fen plants thrive in this kind of habitat. However, today the invasive non-native species common reed (*Phragmites australis*) has formed a dense monoculture over about half of the open fen area. FCVC and PNHP are working on plans to reduce *Phragmites* cover; it will require sustained effort for a number of years.



Purple loosestrife flower (left) and a loosestrife-dominated swamp.

Brian Daggs

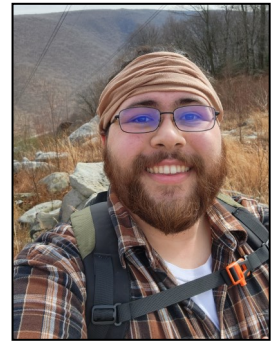
Fertilizer runoff from adjacent agricultural lands may be a factor in the success of invasive species at the site. Fens and bogs are both naturally nutrient poor environments; artificial enrichment of these sites enables generalist species, including *Phragmites*, cattail (*Typha* spp), and purple loosestrife (*Lythrum salicaria*), to thrive, and outcompete the native fen plants that are adapted for nutrient-poor conditions. FCVC is

investigating the runoff sources around the wetlands. Future plans may include water testing and re-routing nutrient rich drainage sources.

A version of this story was also featured in the [Spring/Summer 2024](#) edition of the Pennsylvania iMapInvasives newsletter.

About the Authors

Brian Daggs began working for the Pennsylvania Natural Heritage Program in 2021 as a seasonal ecologist and currently is the program's invasive plant ecologist. Brian completed a bachelor's of science at the University of Pittsburgh in 2020 with a double major in biological sciences and environmental science. In his role, Brian surveys and assesses invasive species populations in Natural Heritage Areas, conducts early detection for priority emerging invasive plant species, and assists in invasive species management planning for the state's natural areas.



Jessica McPherson has worked with PNHP for over 20 years as an ecologist and botanist. She currently works on strategic planning for botany, emphasizing site-based planning, habitat-focused plant conservation, building data-driven management through partnerships, and efficient data capture. She has a particular interest in understanding how the life history and ecology of plants impact their distribution, rarity, and adaptability to change, and in the ecological influence of soil pH and geology.



Claire Ciafré is an ecologist with PNHP. She has over 11 years of experience as a field botanist and ecologist, collecting and interpreting ecological monitoring and classification data as well as conducting biological inventory and rare species survey and demography. She holds a master's degree in Biology from Austin Peay State University in Tennessee.



Notes from the Field

The Allegheny River's Aquatic Mushroom

Hannah Huber, Conservation Mycologist

Years ago, I learned that Oregon's Rogue River was home to a unique aquatic mushroom, representing the first documented occurrence of a gilled mushroom growing completely underwater. The discovery was made in 2005 and published in the journal *Mycologia* as a new species in 2010. They called it *Psathyrella aquatica* and it truly looks like a fish out of water in pictures taken of it on dry land.

I was talking with Garrett Taylor, a community mycologist in Bradford, Pennsylvania when I learned that this mushroom is not exclusive to Oregon. Garrett founded the Allegheny Woodrat Mushroomers and is known for including microscopy in his iNaturalist observations and submitting specimens for DNA sequencing. He also rides an electric unicycle and is a professional chef. During our conversation he casually mentioned that a fellow named Tim Corio spotted *Psathyrella aquatica* in the Allegheny River downstream of the Kinzua Dam just seven months prior.



Connor Duncan

Aquatic mushroom hunters

This past June, I set out from Harrisburg with two coworkers – DCNR Bureau of Forestry Communications Intern Connor Duncan and Ecological Information Specialist (Western Pennsylvania Conservancy) Hope Brooks – to meet with Garrett, and Tim and Darlene Corio at the Kinzua Dam. We were joined by Shawna Daisley, an intern at Oil Creek State Park, and seven WPC seasonal biologists that work in the Allegheny National Forest - Caitlin de Vries, Eric Schill, Isaak Jones, Darien Ehrensberger,

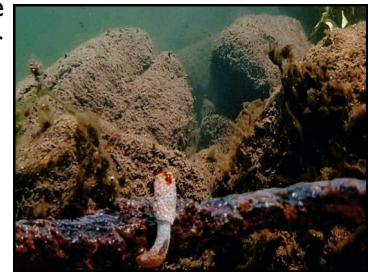


Hannah Huber

Shawna Daisley with the young-stage *Psathyrella* she found.

Derek Sunafrank, Lachlan Ross, and Jackie McGrath. It wasn't long before Lachlan found a stick with some shiny stems growing out of it. Twenty minutes later, Hope found a stick with a complete mushroom wearing a hat of algae. I tried to remove the algae to get a better picture, unfortunately breaking the cap from the stem in the process. *Psathyrella* mushrooms are commonly called "brittlestems" for a reason! A little while later, Shawna called me over, quivering with excitement as she held a stick supporting a thumbtack-sized "baby" *Psathyrella*.

What species name we should attribute to our aquatic *Psathyrella* is a little unclear to me. Specimens from the Kinzua Dam population were DNA sequenced and appear to be closely related to Oregon's *Psathyrella aquatica*. Others have suggested that it should be called *Psathyrella fontinalis*, a species that mycologist Alexander Smith described from northern Michigan in 1972. *Psathyrella fontinalis* has been found growing near creeks and in damp habitats but only Oregon's and Pennsylvania's Kinzua Dam specimens have been found growing submerged in running water. For now, "aquatic *Psathyrella*" is my working term until the taxonomy becomes clear.



Connor Duncan

Submerged young-stage aquatic *Psathyrella* found downstream of Kinzua Dam.

It's hard to say whether aquatic mushrooms are rare or simply overlooked. *Vibrissia* is another genus of aquatic and semiaquatic mushrooms. WPC's Pete Woods and Noah Yawn have found different species of these. *Lentinus tigrinus*, the "tiger sawgill," is a gilled mushroom that grows near rivers on soaked wood. There are nearly 2,000 known species of marine fungi. Fungi in freshwater systems decompose algae, pollen, dung, and are food to invertebrates. There are even fungi in groundwater. Most aquatic fungi are understudied or undiscovered but may have important ecological roles and offer solutions to human problems. In the 1940s, Dr. Giuseppe Brotzu observed in an Italian city that despite sewage and *Salmonella typhi* contamination of the drinking water supply, people weren't contracting typhoid fever. Dr. Brotzu isolated the fungus *Sarocladium strictum* (formerly *Cephalosporium acremonium*), finding it active against *Salmonella* and *Staphylococcus* bacteria, leading to the development of cephalosporin antibiotics.

The Allegheny River was named Pennsylvania's 2024 River of the Year. The U.S. Forest Service has documented more than 50 mammals, 200 birds, 25 amphibians, 20 reptiles, 80 fishes, and 25 freshwater mussels in and around the Allegheny. Now a mushroom can be added to this river's rich biota.

Forty Plus Years of Monitoring of *Marshallia pulchra* on the Youghiogheny River

Steve Grund, Senior Botanist

Beautiful Barbara's buttons (*Marshallia pulchra*), also known simply as *Marshallia*, has been a focus of PNHP since the early days of the program in the early 1980s, when Paul Wiegman and Charles Bier scoured the scours to ascertain



Beautiful Barbara's buttons

Steve Grund

for the first time the extent of the range of the species in Pennsylvania. Prior to that work, *Marshallia* was only known from "Ohiopyle," and we don't know how far up or downstream of the town people had seen it. Wiegman and Bier found scattered populations from



Noah Yawn

Paul Wiegman and Steve Grund monitoring *Marshallia* in 2024.

just below Confluence to just above the mouth of Indian Creek, with a single small colony (now gone) further downstream almost to Confluence.

Since that time, PNHP botanists and ecologists have revisited the populations occasionally, but in 2020 we began a formal monitoring program for the species, which is globally rare and under consideration for federal listing under the Endangered Species Act. We visit some populations yearly, while others are on three to ten-year rotations depending on the relative importance of the population to the species (ten years is for sites where the species has not been seen in many years).

A few of the populations are stable, but many have declined and some have apparently failed. Several causes for the decline have been proposed, and probably all of them contribute:

- The dam just above Confluence has changed the timing, frequency, and intensity of the scour events, and decreased the amount of ice that comes down the river in sheets.
- Climate change has probably resulted in the same changes noted above for the dam.
- A few of the sites are popular with park visitors, and significant trampling of the plants has been documented.
- The piers on the Route 381 bridge at the Borough of Ohiopyle appear to have deflected water away from the scour habitat below that bridge, converting it from a scour to a deposition zone (*Marshallia* requires scour).

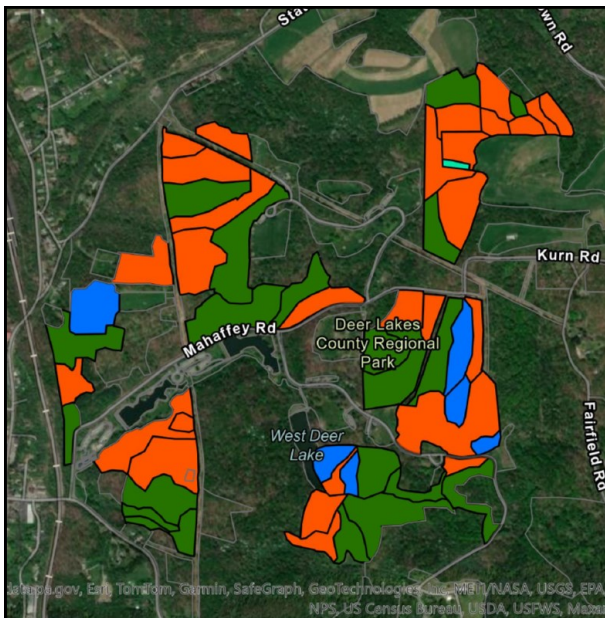
Some of those factors are being addressed, some are under discussion; others may be irreversible.

Deer Lakes Park Ecological Assessment

Noah Yawn, Ecologist

PNHP ecologists and botanists (Noah Yawn, Jessica McPherson, and Brian Daggs) and WPC Community Forestry staff (Brian Crooks) have been working with Allegheny County Parks and the Allegheny County Parks Foundation to complete an ecological assessment at Deer Lakes Park, located in the northeastern part of the county. Deer Lakes is the sixth of Allegheny County's seven parks to be assessed through this partnership, with only North Park remaining.

Like many areas of the state, this park has seen a variety of land uses prior to becoming a county park. However, areas of mature forest remain and were the focus of our initial inventory and assessment efforts. We identified these potential areas by comparing historical aerial imagery from as early as 1939 to modern aeriels to determine where intact forest areas may occur.



A snapshot of our preliminary community typing map of examined mature forest polygon areas at Deer Lakes Park. Each color corresponds to a different upland community type.

An important part of assessing an area's ecological value is through examining community composition, particularly regarding species conservatism, a metric that defines individual species' tolerance of habitat disturbance. Species most sensitive to habitat degradation and most confined to a narrow range of microhabitat conditions are considered to be the most conservative, so the higher the species conservatism value, the less tolerant it is to disturbance. For example, some species, such as poison ivy (*Toxicodendron radicans*) and Virginia creeper (*Parthenocissus quinquefolia*), show high



Noah Yawn

A spectacular hillside of fire pink (*Silene virginica*) found during spring surveys at Deer Lakes Park.

disturbance tolerance and little preference for the quality of a given natural area and consequently have low conservatism values. Species like grass pink orchid (*Calopogon tuberosus*), interior sedge (*Carex interior*), and maidenhair spleenwort (*Asplenium trichomanes*), are examples of disturbance-intolerant species (high conservatism values) that occupy areas with only moderate to little past disturbances, indicating remnant ecosystems that may be of high quality and ecological integrity. Highly conservative species are often watch listed or tracked by PNHP given their rarity and habitat preference. We located three watchlist species at Deer Lakes Park within mature forest areas, as well as common but conservative indicator species such as drooping sedge (*Carex prasina*), fire pink (*Silene virginica*), richweed (*Collinsonia canadensis*), northern maidenhair fern (*Adiantum pedatum*), trilliums (*Trillium grandiflorum* and *T. erectum*), skunk cabbage (*Symplocarpus foetidus*), and Virginia bluebells (*Mertensia virginica*).



Noah Yawn

A skunk cabbage (*Symplocarpus foetidus*) seep, one of the noteworthy high-quality areas at the park that hosts a variety of sedges and wetland species.



Noah Yawn

Mature forest areas were identified and examined during preliminary site visits to Deer Lakes Park since they often contain the most ecologically conservative species, such as spring ephemeral wildflowers like Virginia bluebells (*Mertensia virginica*).

Identifying the areas of highest ecological integrity helps to refine stewardship towards each parks' most irreplaceable features. Intact natural communities include seed banks, mycorrhizal fungus networks, and many ecological interdependencies between species. If these areas are lost or damaged, restoration of these complex features is very difficult. Conservative plant species are often slow to disperse and mature, and therefore very difficult to restore if lost. Trillium, for example, has seeds dispersed by ants, and takes up to seven years to become mature enough to reproduce.

In addition to searching for rare and conservative species in the park, we conducted preliminary forest community typing of identified mature forest areas. Deer Lakes Park hosts a variety of upland forest types, including Northeastern Ruderal Hardwood Forest, Red Oak – Mixed Hardwood Forest, and Dry Oak – Mixed Hardwood Forest, among others. Data on forest



Noah Yawn

An example of high quality, mature Red Oak – Mixed Hardwood Forest at Deer Lakes Park.

community impacts (e.g., dead trees, canopy gaps, spicebush wilt, invasive species), and those from a popular frisbee disc golf course were collected to factor into our assessments and future management recommendations for parks staff.

This project, the latest iteration of many Allegheny County Parks ecological assessments conducted by PNHP and WPC, has been a great collaboration of various partners to help improve the ecological value of Deer Lakes Park and other county parks properties through effective management.

Evening Grosbeak Migratory Connectivity Study Expands Westward

David Yeany II, Avian Ecologist

Most PNHP conservation projects happen within the boundary of our Commonwealth. However, some efforts span state or country lines as species biology or conservation dictates. Our evening grosbeak migratory connectivity study and our coordination of the international evening grosbeak (*Coccothraustes vespertinus*) working group is one of these instances. Since 2021, PNHP has been tapped by the Road to Recovery group to help lead a continental effort to better understand the more than 90 percent decline since 1970 of the evening grosbeak through movement research using new tracking technologies and to address conservation needs for the species within the working group.



David Yeany

A male evening grosbeak perches in the sun at Sax-Zim Bog. He is one of nine grosbeaks which we tagged with Lotek satellite transmitters this winter in Minnesota.

A primary objective of our tracking research is to collect sufficient linkage data between evening grosbeak wintering sites and breeding areas across the North American range of these species that will enable an analysis of migratory connectivity across multiple geographic and subspecies populations. Through these data, we aim to learn more about habitat usage,

migratory ecology, and potential limiting factors throughout the grosbeak's annual cycle. Prior to 2021, we had only tracked evening grosbeaks from Pennsylvania using radio nanotags and the Motus Wildlife Tracking System. But since 2021, we've been able to track grosbeaks from wintering U.S. populations in the Upper Northeast (Maine), Lower Northeast (New York, Pennsylvania), the Midwest (Minnesota) and now in 2024 the Intermountain West with tagging work in Utah this past March. These expanded efforts have only been possible with generous funding support from the Knobloch Family Foundation and new miniaturized satellite transmitters by Lotek Wireless Inc.



David Yeany

To better understand the annual cycle ecology of Western North American evening grosbeak populations, we needed to try to determine which of three call type/subspecies our marked birds belonged to. Mallory Sarver (PARC) prepares to release a tagged grosbeak while Matt Young (FIRN) readies his audio equipment to record any flight calls given by the bird. Hearing or recording the flight call is the only way to identify the call type subspecies.

During February and March 2024, core collaborators from PNHP-WPC, Carnegie Museum of Natural History, and Finch Research Network traveled to Minnesota and Utah, working with local partners at the Friends of Sax-Zim Bog and the Utah Division of Wildlife Resources to capture, tag, and track new evening grosbeaks. For each of five wintering regions in the United States, we aim to collect a minimum of 10 high resolution linking tracks, thus the need for us to return to Minnesota where we tagged nine new grosbeaks and color-banded a total of 12 birds in a non-irruption year for the species.

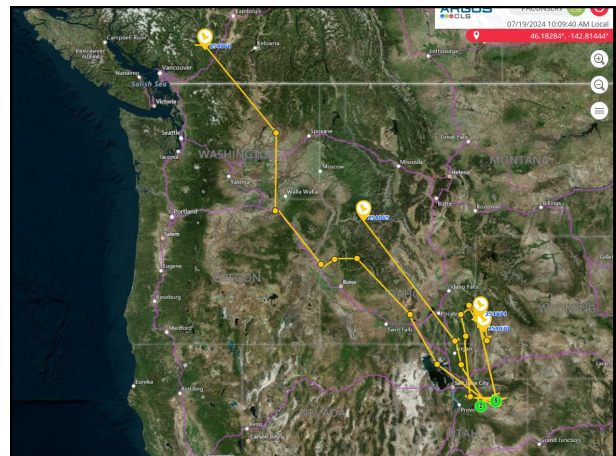
Our fieldwork in Utah was the project's first in the Intermountain West region and the first for two new subspecies/Call Types: Type 1, *Coccothraustes vespertinus brooksi* and Type 4, *Coccothraustes vespertinus warren*. [Evening grosbeaks East of the Rocky Mountains are Type 3, *Coccothraustes vespertinus vespertinus*.] In Utah, we color-banded 51 grosbeaks, deployed satellite tags

on 11 of those birds, and deployed the first ever GPS tag (by Cellular Tracking Technologies) on an evening grosbeak. An added challenge for work in the West was that we needed to try to identify banded grosbeak to its subspecies/Call Type by hearing or recording their distinct flight calls. By giving birds long flight paths to tree cover at release and using our trained ears along with audio recorders, we were able to identify 65 percent of captured grosbeaks to Call Type including 13 birds as Type 4, 20 birds as Type 1, and 25 birds as Type unknown.



David Yeany

This bird was a Type 1 and unexpectedly remained in Utah through the breeding season into late June. This subspecies was not previously known to breed in Utah.



Movement tracks (Mar-July 2024) for 11 evening grosbeaks tagged with Lotek satellite transmitters in Utah. These are the first western grosbeaks to ever be tracked in this way and include birds of two call type/subspecies populations – Type 1 and Type 4.

With this past winter/spring's efforts, our project has now color-banded 453 evening grosbeaks across five states with radio nanotags deployed on 160 birds, satellite tags on 66 birds, and one GPS tag. Full species range migratory connectivity studies are multi-year efforts and require widespread sampling and intensive tagging/tracking efforts. We continue to collect position and movement data on grosbeaks with active tags and have plans for continuing to fill in gaps in our samples, where linking tracks are still needed, from across all five target winter regions in the coming years.

Four County Work Begins!

Rachel Goad, Botanist

This spring PNHP started a new, two-year inventory project in four counties of southcentral Pennsylvania: Adams, Cumberland, Franklin, and York. Coordinated by the South Mountain Partnership, whose focus on the South Mountain Conservation Landscape touches all of these counties, the goal is to collect data and provide an updated assessment of the biological and ecological conditions on the ground to support conservation into the future.

As the coordinating botanist on the project, my first task was to identify which plant populations we needed to visit. Thankfully, our PNHP botany team has done the work of identifying and prioritizing sites across the state into 'tiers,' with those in higher tiers hosting more notable diversity and/or rarity of plant species. Of the 229 botany sites in these four counties, 36 rise to the top as 'tier 1' or 'tier 2' botany sites. This small subset of sites contains 78 percent of the plant populations that we track in these four counties (378 of 573 known tracked plant occurrences). In addition to targeting these high priority sites, our work also focuses on those most in need of update, and especially the species that are of greatest concern on a statewide level. After taking all these needs into consideration, and requesting permission for surveys, the field season began!

Botanists have already found some interesting things this spring and early summer, a few highlights of which we'll share with you here.



Hop tree



Spring coral-root

We re-found a population of hop-tree (*Ptelea trifoliata*) in Franklin County that was last seen in 1997 and feared to be extirpated. We found both male and female trees in flower!

We also re-found a population of spring coral root (*Corallorhiza wisteriana*) that hadn't been looked for in 30 years. Remarkably, we found it in almost exactly the same location where it had been documented in 1993.



Hairy waterleaf



Rigid sedge in diabase meadow

Rachel Goad

We surveyed the only known location of hairy waterleaf (*Hydrophyllum macrophyllum*) in the four county region. This species is much more common south of us, but it reaches its northern range extent in southern Pennsylvania.

We've been updating occurrences in diabase meadows of Adams County, which has included some occurrences of rigid sedge (*Carex tetanica*). While not the showiest plant, this sedge needs specific conditions that are not present in much of modern-day Pennsylvania.

Wrangling Data for Invertebrate Conservation

Betsy Leppo, Invertebrate Zoologist

PNHP staff continue to work with partners to gather and digitize data to determine the conservation status of hundreds of currently unranked terrestrial and aquatic invertebrates for the 2025-2035 Pennsylvania Wildlife Action Plan (PA-WAP). We also are processing information from large online databases like iNaturalist and the Global Biodiversity Information Facility (GBIF). We are taking datasets through the process of quality control, standardizing fields, comparing taxonomies, and pulling records for the approximately 1,400 species we are targeting for assessment or reassessment. Data accumulation is a time consuming and tedious process, but it is rewarding to see the work of so many people, from recreational naturalists to professional taxonomists, be utilized in this project. We could not do these assessments without the enormous efforts and expertise of others.

Rachel Goad

The 2015-2025 PA-WAP listed 664 Species of Greatest Conservation Need (SGCN). Of those, 450 SGCN were terrestrial or aquatic invertebrates. That number seems large but is not surprising since the diversity of invertebrate species greatly exceeds that of all the birds, mammals, fish, reptiles, and amphibians combined. Large datasets from iNaturalist, GBIF, and museum collaborators are providing much more information than was available when the first two editions of the PA-WAP were completed in 2005 and 2015. We expect the number of SGCN invertebrates to grow as we assess more species. We also may remove species from the SGCN list if new data shows them to be more common than we previously thought. This is why it is so important to revisit state ranks and SGCN statuses on a routine basis as data resources improve and as species expand or contract their ranges due to climate change and other factors. We anticipate that some species we wish to evaluate will remain unrankable because we do not have enough information yet to assign a status. Despite the increase in data available for assessments, there are still many uncommon, non-descript, small-bodied, difficult to survey, or tough to identify species that remain underrepresented.



Pete Woods

Microbembex monodonata on white sweet clover at Presque Isle in Erie County.

We have begun the process of generating state ranks for some new species, such as *Microbembex monodonata*, a species of sand wasp. The main population known in Pennsylvania is located at Presque Isle in Erie County. In our region this wasp is mostly restricted to sandy coasts, so it probably does not occur elsewhere in the state. The two known populations nest in sandy habitats that are frequented by people, and are potentially threatened by foot traffic, beach grooming, development, and loss of sand movement along the coast. This wasp has not been ranked for its global rarity, but we have assigned a tentative state rank of S2 (state imperiled). Assigning state ranks to species using

standardized methodology is necessary before determining its potential status as a Species of Greatest Conservation Need, and will also facilitate future efforts to determine its global conservation status.

The PA-WAP will benefit groups of invertebrates, like fireflies, that are beloved to Pennsylvanians. As we prepare this newsletter, it is prime firefly season. PNHP staff have gotten several inquiries about how our fireflies are doing and how to help them. We have more than 40 species of fireflies in Pennsylvania, and we are planning to evaluate the conservation status of eight firefly species for the PA-WAP. Five of these species have already been designated as Regional Species of Greatest Conservation Need (RSGCN). Part of the species assessment process includes researching the life history information of each species, which helps us understand their habitats and special requirements, along with threats to their populations in Pennsylvania. Funding through the State Wildlife Grant Program is critical for continuing species assessments for invertebrates. Species that qualify for SGCN status are more likely to be prioritized for research, best management practices, and other conservation actions.

Wetland Assessments on State Lands

Mary Ann Furedi, Ecological Assessment Manager

Who likes to work in wetlands? PNHP ecologists certainly do! With funding from an EPA Wetland Development Grant, the PNHP ecology staff are continuing their long history of exploring wetland systems in Pennsylvania. The current project focuses on the development and testing of assessment methodology to help resource managers understand the condition of their wetland resources. Given that forests cover more than 60 percent of the Commonwealth's land, it is not surprising that traditionally forests have been the main targets of management. However, wetlands also play an



Mary Ann Furedi

An example of a wetland that will be assessed under this project.

important role on the landscape and require active management and protection as well. Understanding the condition of wetlands is the first step to reacting to threats and successfully managing these systems.



Mary Ann Furedi

Claire Ciafre, a PNHP ecologist, recording information on the stressors associated with the wetland.

Since wetland condition assessments are a more commonly used tool, PNHP ecologists started by reviewing existing methodology. They also met with DCNR staff to identify what their needs are, what information is important to them, and how this information can be used to generate management actions. From these meetings, PNHP staff were able to develop a draft protocol that allows for the rapid collection of data that are most meaningful to resource managers. The protocol focuses on verifying that a wetland is present, provides some information about the plant community composition of the wetland, and uses a stressor checklist to identify threats to the wetland, both in the wetland and the surrounding upland buffer. The next step is testing. Our PNHP ecologists will be very busy this field season and next as they apply and refine the protocol in selected wetlands across the state.

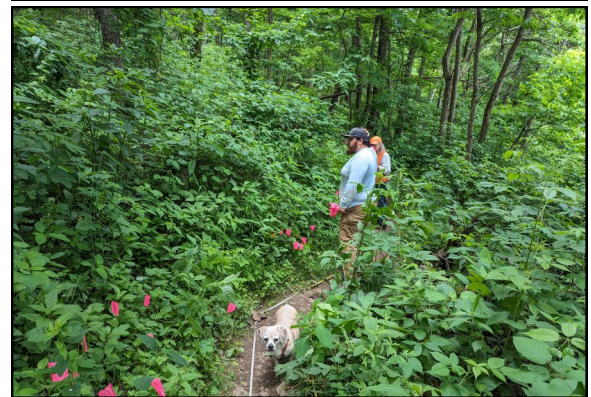
Insights from Monitoring two Globally Rare Plant Species

Jessica McPherson, Senior Botanist

After the running buffalo clover (*Trifolium stoloniferum*) was delisted under the Endangered Species Act in 2019, the U.S. Fish and Wildlife Service requested five years of monitoring throughout the range. PNHP has now completed this for all Pennsylvania populations where access permission has been granted. The results indicate that in many settings continuous management is needed, and the species responds quickly to management changes. This is consistent with findings elsewhere in the range.

One small, unmanaged population in a calcareous forest setting declined from seven plants to zero in three years.

When a population on the Laurel Highlands Hiking Trail was first censused in 2020, the trail edges had been mowed to 3 inches; almost no flowers were observed that year, but there were many densely growing small plants, a growth pattern apparently caused by mowing. In the years since then, monitoring has shown a steady increase in cover by taller native species, such as blackberry and invasive species like multiflora rose, and a steady decrease in the number of running buffalo clover crowns present. Many areas that are fully shaded with larger vegetation no longer have running buffalo clover plants present. This site clearly requires periodic close mowing or hand-harvesting of competitive species to maintain the population.



Jessica McPherson

The same view of the Laurel Highlands Hiking Trail, in 2021 (top) and 2024 (bottom), showing how much the vegetation has grown since 2021 mowing.

One population on a private gravel road declined for several years after a regular mowing regime decreased. However, in 2023 we hand-pulled large native species such as Monarda and wingstem; flowering also happened to be particularly abundant this year. In 2024, the number of plants had more than doubled, reversing a trend of decline even without the former mowing regime being reinstated.

A population that is in a floodplain setting, with no nearby road or trail edge, appears to be fairly stable after three years of monitoring (it was discovered in 2021).

Spreading rockcress (*Arabis patens*) is a globally rare mustard that thrives in crevices of limestone rock. Little information is known about this species. In the Flora of North America, it is described as “biennials or, rarely, perennials.” The longevity of individual plants at our Pennsylvania sites is a crucial piece of information needed to determine how often monitoring must be conducted to detect changes in the population. If it is truly biennial, individuals turn over every two years, and the population must replenish annually from seed. Monitoring must be done frequently to detect fluctuations.



The same spreading rockcress plant in 2023 (left) and 2024. (right) This “biennial” produced flowering stalks in at least two consecutive years.

Jessica McPherson

Biennials produce a rosette in their first year, flower in the second year, and then die. However, Peter Zale of Longwood Gardens reports that in a greenhouse setting, spreading rockcress plants grew as evergreen perennials. We observed in our first year of monitoring that some plants had many dead flowering stalks from previous years, which is atypical behavior for a biennial. In our second year of monitoring, most plants persisted from year to year. Thirty-five of the 39 plants documented in 2023 were relocated, while only four appeared to have died. Several plants observed as basal rosettes in 2023 were still in rosette form in 2024. Eleven new plants were observed, six rosettes and five with flowering stalks. The mix of flowering stalks and rosettes in the new plants suggests plants can mature from seed to flowering in a single year, or that a fall-grown rosette can flower in the spring of the following year. These observations suggest that maturation and plant death are not pre-programmed but occur in response to plant health and environmental conditions.

Joining the Team and Jumping Right In!

Lauren Sherman, Zoologist

I recently accepted a position as a zoologist with PNHP knowing it was no ordinary job. This was the one I’ve been working toward since I can remember – my dream job! I was going to be out in the field, surveying threatened and endangered species, and becoming an active player in the conservation of native wildlife. But no matter how long I had been hoping for this opportunity, nothing could have fully prepared me for the extraordinary and chaotic nature of this job. I knew right away that this was the chaos I belong in.

After packing up and making the trip from Lexington, Kentucky to Harrisburg, Pennsylvania, I had approximately three days to catch my breath and settle in before I started field work. I had never participated in bat surveys before, so to be useful, I set out to learn some new skills while adapting to a nocturnal schedule. I worked on developing my knot tying skills, my patience for untangling mist nets, and, most importantly, the presence of mind to not tangle the nets in the first place to make up for my inability to develop patience. There’s a lot of waiting involved in mist netting, so I also had the opportunity to get to know my coworkers, meet new people, and learn more about PNHP than I probably would have in several months of sitting at a desk. There’s no better way to learn than to do, and wow, we sure did a lot in my first few weeks.



This hoary bat was one of eight species of bats we netted over two nights during a survey in Blair County.

Ryan Miller

After we finished the bat work, we dove right into green salamander surveys. It was challenging and sweaty work, pushing through thick brush and thorns and climbing around rocky outcrops, but there’s very little I wouldn’t do to see a salamander. Conducting surveys in the afternoon during the hottest week of June was slightly brutal, combined with the fact that we were also



Ryan Miller

A green salamander utilizing woody debris to travel through the forest.

surveying at night, meaning I was unable to break my absurd sleep schedule. Yet, I'm so excited to go back out and do it again. Even working in the office brings me new experiences almost every day, whether I'm going through camera trap data looking for weasels or sorting through archived bat data.

Despite the challenges of my first few weeks, I cannot imagine a better start to my career at PNHP. The variety of work I've been able to participate in is astounding. I highly doubt that any two days of work will ever look the same for me as long as I'm here, and I'm eager for the challenge of continuous learning and growth. I've met some incredible, passionate people already, and I look forward to getting to know the rest of the organization. I'm incredibly happy to be here and I can only imagine what the rest of my career with PNHP will bring!



Ryan Miller

Lauren Sherman surveying for green salamanders.

It Pays to Keep Looking

Scott Schuette, Botany Manager

PNHP in coordination with the USFWS has been monitoring a population of small-whorled pogonia (*Isotria medeoloides*) as part of a range wide effort to develop regional recovery strategies for this federally threatened orchid. This lovely plant grows in mixed forests with sparse canopy cover along streams, usually on the bench directly above the stream channel. Decades of habitat conversion and modification has led to the extirpation of most of the populations for this species in Pennsylvania. However, there is hope for the species. PNHP Botany Manager, Scott Schuette and DCNR PCA Coordinator, Cheyenne Moore discovered two new plants at the one extant population and relocated a plant from a population that hadn't been seen since its discovery in 2019. These exciting new finds give us hope that this beautiful orchid will remain in our forests for the foreseeable future.



Scott Schuette

Two plants with double fruits, which is relatively rare throughout the range of *Isotria medeoloides*.