Pennsylvania Natural Heritage Program

information for the conservation of biodiversity

WILD HERITAGE NEWS

Spring 2023

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Photo Banner:
Sampling plant communities on a Schuylkill River island.

Mary Ann Furedi

The Multi-Faceted Value of Floodplains

by

Mary Ann Furedi, Ecological Assessment Manager

When you hear the word floodplain, what comes to mind? Maybe you think about your favorite fishing spot along the Allegheny River or the place where you launch your kayak when boating the Lehigh. You might recall the rocky shoreline in mid-summer where you swam as a child or the isolated pools next to a wide creek where you once searched for tadpoles and salamanders. It is true that floodplains are great places for recreational activities, and yet, they provide far more benefits beyond these for both humans and nature.

What are floodplains?

To begin to understand the value of floodplains, we need to define what they are. Floodplains are the low-lying areas adjacent to streams, rivers, lakes, and oceans that periodically flood (Federal Interagency Stream Restoration Working Group, 1998; Interagency Floodplain Management Task Force, 1994). They serve as the transition zone between terrestrial and aquatic ecosystems and help to mitigate hydrological changes that occur both on land and in bodies of water.

Natural floodplains vary in width depending on multiple factors including geology, surrounding landforms, climate, and season. Width is also a function of past and current land use. Early colonization and urban growth around bodies of water have resulted in floodplain alteration and loss. Floodplains also vary in the amount of vegetation they support and range from sparsely vegetated rocky shores to palustrine shrublands and forests.

The importance of floodplains for humans

Besides recreational opportunities, floodplains provide a multitude of beneficial functions for humans. One of the most

Mary Ann Furedi

This floodplain meadow is an example of a plant community associated with floodplains in Pennsylvania.

recognizable is the role they play in flood control. We are all familiar with video clips from weather channels of rivers overflowing their banks during large storms. Floodplains help mitigate these events. A floodplain is essentially an extension of the main river channel that gives a river more room to spread out during high water events like spring snow melt or severe rainstorms. Naturally functioning floodplain systems help dissipate floods which, in turn, reduce adverse impacts to humans, property, roads, and other infrastructure. Healthy floodplains are nature's flood protection mechanism.

Mary Ann Furedi

Flooding of the floodplain forest along the Lehigh River after Tropical Storms Fred and Henri moved through the Poconos in August 2021.

Floodplains also play less visible, but equally important roles during flood events. As floodwaters slow and spread, there is more time for water to sink into the ground and replenish groundwater supplies (also known as aquifer recharge). Reduced floodwater velocity results in the release of suspended sediments and nutrients (also known as alluvium). This not only helps to improve water quality downstream but also benefits agriculture. Rich alluvial deposits help create the fertile soils often associated with river valleys and deltas. This is one reason why many agrarian societies became established around river systems and why farming still continues in these areas today.

Floodplains help to filter and store water that flows from the land too. During downpours, large amounts of water falling in a short period of time can't be absorbed immediately and result in runoff. Floodplains help to process surface runoff and remove nutrients and pollutants which contributes to better water quality by reducing non-point source water pollution. Given that storm events are becoming more severe because of climate change, functioning floodplains will become even more important in the future.

The Ecological Importance of Floodplains

The disturbances and stresses associated with floodplains can make them pretty difficult places to live. Floodplain plants and animals have adapted to conditions and thrive in these areas. Floodplain plant communities occur in an arrangement of zones that correspond to hydrology, water flow, and soil accumulation. Emergent vegetation may occur in the wettest portion of the floodplain, closest to the main channel. As the growing season progresses, once submerged portions of the shoreline become exposed and are colonized by herbs and grasses. Shrub and tree species may become established here as well, depending on their tolerances to extended saturation and strong river currents. Forests and shrublands may become established closer to the upland side of the floodplain, where soils have accumulated and floodwaters are less forceful and shorter in duration. Some plants have become highly adapted to floodplain stress and only occur in these areas (see Botanical Importance of the Lower Susquehanna Gorge).

Floodplain vegetation provides multiple ecological functions for many organisms and the maintenance of the floodplain system. Floodplain vegetation is a source of food and habitat for a variety of wildlife (e.g., nesting and roosting areas for birds). Floodplain forests shade stream and river channels, regulating temperature and promoting higher dissolved oxygen levels. Vegetation helps to control erosion and sedimentation by holding onto soil and slowing water velocity, while also filtering pollutants and improving water quality.

Mary Ann Furedi

A floodplain forest community

In addition to the vegetation structure and composition that creates floodplain habitat for wildlife, microtopography and flooding play roles in creating ideal places for wildlife as well. Vernal pools and

wetlands may be features of floodplains. These areas help contain excess floodwaters and serve as breeding grounds and nurseries for amphibians, fish, and invertebrates; all of which contribute to the aquatic food chain.

Over the years, floodplains have been a focus of multiple projects conducted by the Pennsylvania Natural Heritage Program (PNHP). These projects ranged from understanding the plant communities that occupy these zones to documenting species that use floodplain habitat. Our work has helped define the biological value of floodplains in Pennsylvania.

Pete Woods

The rare buffalo moth (*Parapamea buffaloensis*) lives in floodplain swamps, where stands of lizardtail (*Saururus cernuus*) grow.

Plant communities of under-sampled river systems in Pennsylvania

One focus of PNHP's work has been to characterize the plant communities associated with major river systems in Pennsylvania. Through a variety of projects, PNHP ecologists have documented the palustrine communities that occur along the Allegheny, Susquehanna, and upper Delaware rivers. Through an EPA Wetland Program Development Grant, PNHP ecologists can now characterize and assess the condition of floodplain communities associated with the Potomac, Genesee, Lehigh, and Schuylkill rivers. So far, we've found that most community types are similar to those found along other rivers in the state. However, there are some regional differences too. This information will be used to further refine our plant community descriptions and will provide a baseline of current conditions to help gauge future changes to these valuable areas.

Visit our website to learn more about the types of palustrine plant communities found in Pennsylvania. https://www.naturalheritage.state.pa.us/Wetlands.aspx

Mary Ann Furedi

Periodically Exposed Shoreline Community is a common plant community type associated with the narrow floodplains of the Schuylkill and Lehigh Rivers.

Devil crayfish assessments in Pennsylvania

The devil crayfish (*Lacunicambarus diogenes*) is a burrowing crayfish whose habitat includes floodplains. In Pennsylvania, the crayfish was only known from a few locations in the southeastern portion of the state. Due to habitat degradation and loss from urbanization and competition from invasive crayfishes, it was assumed that most populations of the species had disappeared or were greatly reduced. However, hope was renewed in 2017 when the species was collected for the first time in Pennsylvania in more than 100 years. Unfortunately, recent thorough surveys of most potential habitats in Pennsylvania have failed to detect additional devil crayfish populations and the one known population has been invaded by non-native red swamp crayfish *(Procambarus clarkii*) and appears to be in decline.

Dave Lieb

Devil crayfish build burrows on floodplains but populations have greatly diminished in Pennsylvania.

Botanical importance of the Lower Susquehanna Gorge

Near the Pennsylvania/Maryland state line, the Susquehanna River flows through an ancient gorge that was formed by rapid glacial drainage during the late Pleistocene. Here, the river begins to "fall" towards the coastal plain. Many rare plants have been documented here, including species restricted to the particular habitats present and those at the edge of their range.

One of the special habitats present in the Lower Susquehanna Gorge is riverscour. These areas are periodically inundated or scoured by the river. This disturbance is critical to the maintenance of an open canopy. Across the U.S., river-scoured communities are becoming increasingly recognized for the diversity of rare and specially adapted species they support. In the lower Susquehanna, these include Susquehanna doll's daisy (*Boltonia asteroides* var. *asteroides*) and sticky goldenrod (*Solidago racemosa*).

Rachel Goad

Susquehanna doll's daisy

Several rare species requiring early successional conditions are also present in this gorge, occurring on or near riverscour, powerline rights of way, and pockets of vegetation in thin soil of rocky outcrops. In the lower Susquehanna, these include cymose beak rush (*Rhynchospora recognita*), bushy aster (*Symphyotrichum dumosum*), and gammagrass (*Tripsacum dactyloides*).

For more information about the importance of riverscour, visit https://www.naturalheritage.state.pa.us/SpeciesFeatures.aspx

Mary Ann Furedi

An example of a Floodplain Scour Community found along the Schuylkill River.

What we can do to help floodplains

Floodplains are a valuable resource for humans and nature and will become even more so in the future given the threats of climate change. However, we continue to lose them because of encroaching development, mining, agriculture, and other activities. Protection and restoration of floodplains should be a high priority if we hope to protect public safety, maintain water quality, and restore natural habitats. Here are a few things you can do to help floodplains.

Learn more about the value of floodplains in your community.

- Follow the planning and zoning rules for construction near floodplains.
- Dispose of garbage properly so it doesn't end up littering floodplains and being washed into aquatic systems.
- Participate in river clean-up events.
- If you own property on a floodplain, consider improving the riparian buffer by planting trees that help to stabilize the system. For more information about the riparian planting work being done by the Western Pennsylvania Conservancy, see https://waterlandlife.org/watershed-conservation/riparian-plantings/. For advice and financial assistance for landowners visit the DCNR Buffer My Stream webpage https://www.dcnr.pa.gov/Conservation/Water/RiparianBuffers/BufferMyStream/Pages/default.aspx

Through education and effort, we can help ensure that floodplains continue to provide the many valuable benefits for humans and the environment.

About the Author

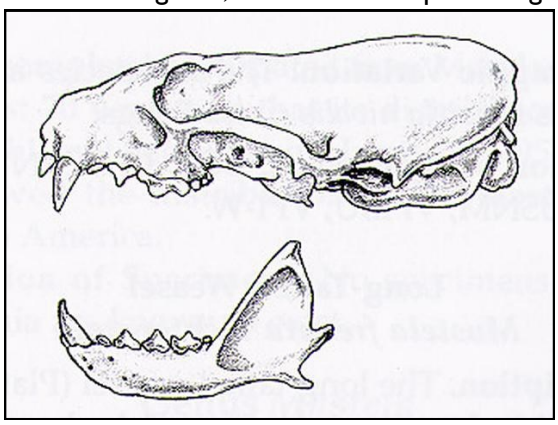
Mary Ann has worked with the Pennsylvania Natural Heritage Program for 15 years as a community ecologist and currently serves as the Ecological Assessment Manager. She received her B.S. in Biology from Fairleigh Dickinson University and her Ph.D. in Biology from West Virginia University. Her projects generally focus on characterizing the current conditions of natural systems in Pennsylvania and understanding how these systems change over time.

Weasels of Pennsylvania

by

Joe Wisgo, Zoologist

Pennsylvania is home to an array of fauna with some the most interesting belonging to the family Mustelidae, otherwise known as the weasel family. Native members of this family currently found in the state include the North American river otter (*Lontra canadensis*), American ermine (*Mustela richardsonii*), long-tailed weasel (*Neogale frenata*), least weasel (*Mustela nivalis*), American mink (*Neogale vison*), and fisher (*Pekania pennanti*). These species vary in their habitats and physical appearance, but they share a few unique characteristics that include short legs, elongated bodies, short heads, medium to long tails, and well-developed anal glands.



Donald W. Linzey, Mammals of Virginia

Long-tailed weasel skull. Elongated and compressed skulls allow weasels to forage in tight spaces

The American ermine, long-tailed, and least weasel are the three smallest mustelids to reside in Pennsylvania and share many life history traits. For the most part, all three weasels occupy a variety of habitats and can be considered generalists, but they do prefer areas with heavier cover that include fencerows, stone piles, old fields, pastures, riparian edges, and to a lesser extent, mature forests. These areas not only provide habitat for their prey, but also offer weasels protection from larger mammalian and avian predators.

Weasels are carnivores that primarily target small mammals such as shrews, mice, and voles as prey, but they are also known to consume amphibians, reptiles, birds, and insects. The least weasel, the world's smallest carnivore weighing in at one to two ounces, readily kills prey its own size or larger; however, given its miniscule size, it is also an easy meal for other predators. All three species are chiefly nocturnal or crepuscular with peak activity usually occurring after dusk, but they will sometimes hunt during daylight hours.

Keith and Kasia, CC by SA 2.0

The long-tailed weasel is the largest of Pennsylvania's weasels. Total length is 11.3 to 17.6 inches including a 3.2 to 6.3 inch tail. Pelage is brown with a buffy or yellowish underbelly, chin is white, and feet are brown.

Steve Hillebrand, USFWS

The American ermine is 9 to 11.5 inches in length, including a 2.3 to 3.2 inch tail. Chin, throat, and underparts are white extending down the insides of the legs including the feet. The tip of the tail is black.

Jerzy Strzelecki

Smallest of the weasels found in Pennsylvania, the least weasel is 7.1 to 8 inches in length, including an approximately 1.5 inch tail. The chin and feet are white, and the brown tail has no black tip.

Sexual dimorphism is a condition where morphological characteristics of the same species differ between sexes. All three weasel species found in Pennsylvania exhibit sexual dimorphism in terms of size, and on average, male weasels tend be larger than females. Weasels are also a fairly vocal species and depending on whether they are disturbed, being threatened, playing, mating, or just exploring their surroundings, their vocalizations can take the form of trills, squeaks, hisses, purrs, chatters, screeches, and grunts.

Some species of weasels such as the American ermine and the long-tailed weasel employ a unique reproduction strategy known as delayed implantation where after copulation, the embryo only develops to a certain extent and implantation into the uterine wall is delayed until conditions are more favorable. In the case of the American ermine and the long-tailed weasel, copulation takes place during summer and a single litter is born during the following spring. In contrast, least weasel females are polyestrous so they can breed any time of year and produce multiple litters.

With a noted decline in small carnivores globally and a scarcity of recent information on weasels in Pennsylvania, there has been a renewed interest in acquiring data on the three species of weasels in our state. Currently, a collaborative effort between PNHP and the Pennsylvania Game Commission (PGC), along with other cooperators is underway to test different passive detection methods for weasels using game cameras. This project is intended to develop survey and trapping protocols to target weasel species in suitable habitats near our most recent and historic records as well as document new locations.

PNHP/PGC

Potential weasel habitat in western Pennsylvania

A variety of camera traps are being tested in arrays that include two or more of the following set types, mostela can set, bucket set, and oblique set. The mostela can is based on a European design and consists of a large ammunition can housing a game camera focused on a dual sided entry way. The bucket set-up is similar to the mostela in that it contains an enclosed camera with a double sided entry way except that the camera is oriented vertically rather than horizontally. Each of these sets are baited with commercial trapping lure and 'kill squeaks' which are auditory lures that emit periodic rodent squeaks. The oblique setup simply consists of a game camera facing a PVC tube baited with commercial trapping lure and a rodent or shrew as bait. All three camera sets contain a scale bar to aid in species identification. These arrays are placed in potential habitat for approximately 60 days and photos are collected every 20 days when sets are rebaited.

PNHP/PGC

Mostela can set (left) and bucket set (right) placed in habitat.

While we are interested in locating occurrences of all three Pennsylvania weasel species (long-tailed weasel, American ermine, and least weasel), our focus is on the least weasel. Sightings for this species in Pennsylvania are extremely rare, with reports and specimens in the last 20 years numbering in the single digits. Despite this lack of recent information, little survey effort actually targeting this species has occurred in the state. In fact, Pennsylvania's 2015 State Wildlife Action Plan did not include this species because there was not enough data to make any informed determination on its status. Because our focus is on the least weasel, our surveys are taking place in the western portion of the state, which is the bulk of the weasel's range in Pennsylvania.

Our arrays have detected long-tailed weasels and possibly American ermine, but we have not had any positive detections for the least weasel. Other mustelids captured by our arrays include mink and

fisher. Each camera set (mostela, bucket, and oblique) has proved successful at capturing photos of weasels as well as many other species ranging in size from small shrews to deer. These surveys will be ongoing until project completion in 2024.

PNHP/PGC

Long-tailed weasel attracted to a rodent bait at an oblique set.

PNHP/PGC

Weasel entering a mostela can.

Some mustelids have been extirpated from Pennsylvania for many years. The American marten (*Martes americana*) which once inhabited Pennsylvania's forests has not been considered a resident mammal in the state for over a century. Deforestation which led to changes in forest type and age class along with unregulated harvest presumably led to their extirpation from our state.

American marten, roughly the size of a mink or small house cat, have a lush coat consisting of long, dense, glossy fur ranging in color from golden to dark brown with an orange to tawny chest patch. Unlike other members of the weasel family found in our state, marten have semi-retractable claws that allow them to move with ease both vertically and horizontally throughout the forest floor and canopy. Similar to other mustelids, they display sexual dimorphism and employ delayed implantation. In the northern portion of its range on our continent, marten typically inhabit heavily canopied coniferous forests, but in the southern portion of its range, it is usually found in mixed stands. However, it is also known to sometimes adapt to purely deciduous forests.

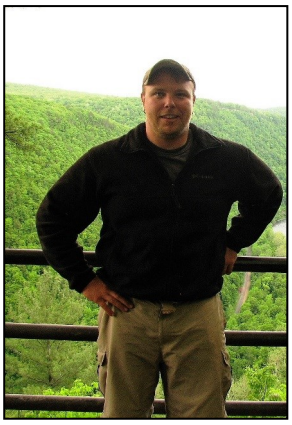
Michigan Nature Association

American marten

Recently, the PGC completed a feasibility study on the reintroduction of marten into Pennsylvania. As part of the study, PNHP conducted a study to determine the relative abundance and species richness of small mammal prey species overlapping potential marten release sites. Since the mid-1980s, biologists from Pennsylvania agencies and organizations have been methodically collecting data on small mammal species through various survey efforts, and these data were used to provide a reasonable estimate on prey availability. Though omnivorous, small mammals such as mice, shrews, and voles make up the majority of their diet throughout their range. The analysis conducted by PNHP found that there would be suitable amounts of small mammal prey available at potential release sites. While there are still many steps ahead of an actual reintroduction, the project has passed the feasibility stage and is moving forward.

While some mustelids might be considered a nuisance to some, they do play an important role on Pennsylvania's landscape. Not only do they help control other species populations, but they can also aid in seed dispersal via their droppings as they move throughout the forest. In all, every mustelid found within the state has a significant role within their ecosystems and we as humans should focus on their benefits.

About the Author



Joe Wisgo began his career with PNHP in 2011 as a zoology intern and now serves the program as a zoologist. He received his B.S. in Biology from Susquehanna University and his M.S in Biology from Shippensburg University. His work primarily focuses on surveys for rare, threatened, and endangered mammals, but he also assists on other vertebrate projects in multiple capacities.

Notes from the Field

Collaboration to Support Pennsylvania's Rarest Plants

Rachel Goad, Botanist

In mid-March, PNHP staff and researchers from Bucknell University visited all three Pennsylvania populations of Canby's mountain lover (*Paxistima canbyi*). Physically, it was quite a challenge for winter legs! This low-growing evergreen shrub lives on steep ridges and bluffs, so getting to each one involved a climb or a scramble, and one of the sites required crossing a knee-deep creek. Despite the difficulties, we were able to make careful collections for genetic analysis from all populations.

PNHP has collaborated with Bucknell University on a variety of projects focused on population genetics of rare plant species, and this year we've begun to collaborate on three new species: Canby's mountain lover, as mentioned above, as well as box huckleberry (*Gaylussacia brachycera*), and bog Jacob's ladder (*Polemonium vanbruntiae*). These are some of the rarest plants in Pennsylvania and understanding the genetic attributes of these populations – something we cannot learn from field observation alone – will help us to protect them into the future. For instance, if we learn that populations are inbred or comprised of very few genetic individuals, cross-breeding between populations could be used to help improve the health of these populations. Alternatively, we may learn that some of these populations are genetically healthy and that other kinds of measures may be more important.

Chis Martine

Botanist Rachel Goad and MS Student Isaac Buabeng at a Canby's mountain lover site this March.

Road to Recovery Evening Grosbeak Project – Winter 2023

David Yeany, Avian Ecologist

In January 2023, we began our second year of field research on winter evening grosbeak populations as a *Road to Recovery* project with funding from the Knobloch Family Foundation, and our seventh overall year of work with evening grosbeaks. Working with our collaborators from Powdermill Avian Research Center and the Finch Research Network, we traveled to field sites in Minnesota, New York, and western Pennsylvania to color-band evening grosbeaks and deploy radio and satellite transmitters for tracking movements, landscape use, and migration across seasons.

David Yeany

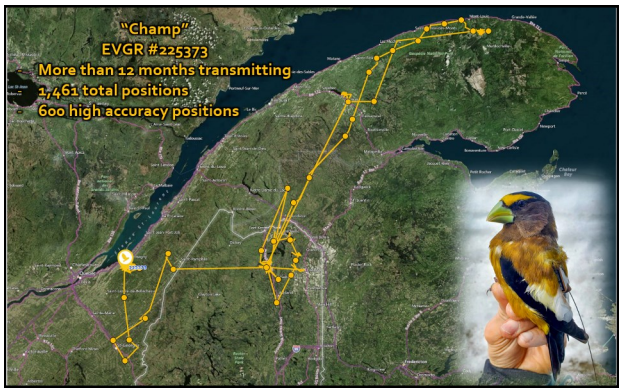
A male evening grosbeak outfitted with a Sunbird satellite tag, just before release in Minnesota.

We banded 53 grosbeaks in Minnesota at Sax-Zim Bog and deployed Sunbird satellite tags on eight of those birds. We made trips to both southern New York and the Adirondack Mountains of upstate New York where we banded 63 grosbeaks and deployed nanotag radio transmitters on 26 birds and Sunbird satellite tags on 5 birds. We were excited to have a large enough winter population this year close-to-home to allow us to deploy satellite tags on evening grosbeaks in western Pennsylvania for the first time. While we refer to these as winter populations, evening grosbeaks can spend 6 or 7 months a year in Pennsylvania from November through May. This season grosbeak numbers seemed to reach a high point in mid-January with 200 or more individuals counted at a single time at our field site in Forest County. Through early April, we banded 58 grosbeaks in Pennsylvania deploying nanotags on 24 of those birds and Sunbird satellite tags on 17 birds, with several tags left to deploy yet this season.

REVEAL Tactacam

We monitored evening grosbeaks via cellular trail cameras throughout the season at our Forest County, PA research site.

All totaled across the three states this winter season, we color-banded 210 grosbeaks and deployed 55 nanotags and 33 Sunbird satellite tags. None of our tagged birds have shown significant movements northward or out of their core wintering area yet, but we eagerly anticipate that happening as days grow longer this spring. We look forward to sharing tracks and accounts from Pennsylvania's evening grosbeak population in the near future. For now, we have an example of the amazing data we can collect from the Sunbird satellite tags in our male evening grosbeak # 225373 from Maine – nicknamed "Champ" – as it has the longest running satellite transmitter yet for our project, surpassing the one year mark in early April this year. This full annual cycle data is just the type of information our project is designed to collect on this mysterious and declining boreal finch.



David Yeany

This map documents "Champ's" journey over the past year in never-before-seen detail from winter 2022 in Maine to summer in Gaspé Peninsula, and southward to winter 2023 near Montmagny, Quebec.

Link to *Road to Recovery* project page:
https://r2rbirds.org/tipping-point-species/evening-grosbeak/

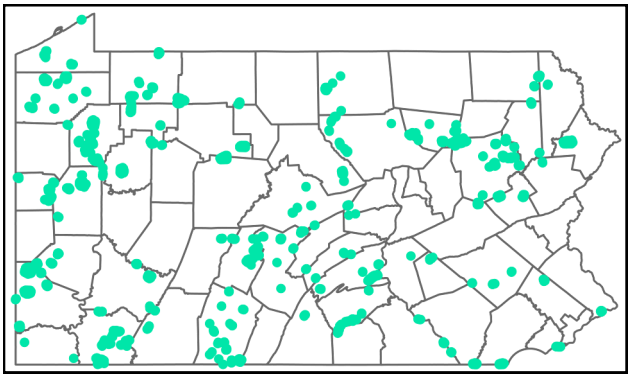
Link to WPC project page:
https://waterlandlife.org/wildlife-pnhp/species-at-risk-in-pennsylvania/evening-grosbeak-birds-species-irruptive-migration/

An Efficient and Collaborative Approach to Field Season Planning

Molly Moore, Heritage GIS Coordinator

The 2023 PNHP field season is nearly in full swing! Field season is one of the most exciting and dynamic times of the year as our biologists head outside to make new discoveries, assess existing species populations, steward areas of high biodiversity, and carry out interesting research projects. However, before anyone actually steps outside, there is a lot of work that goes into planning for a successful field season.

Throughout the winter months, PNHP biologists work hard to prioritize survey sites for the field season and prepare for their upcoming surveys. In the past, PNHP biologists did most of their field season planning and preparation individually. Collaboration was typically limited to groups with similar taxa interests or individuals working on similar projects. In a programmatic effort to bring a more systematic approach to updating core PNHP products, it became clear that there was a great opportunity to improve our field season planning process as well. Introducing the FIND Planning App!



The planned survey areas for the 2023 field season. So far this year, seventeen biologists have entered 280 planned survey sites across 56 of the 67 Pennsylvania counties.

The FIND Planning App (FIND PA) is an ArcGIS web application that allows users to enter and view the location and information about planned survey sites for the upcoming field season. The ArcGIS Online platform is consistent with other tools and applications that are used within PNHP, providing a familiar data entry environment that allows for simultaneous multi-user viewing and editing. The simple front-end design of FIND PA is specific to field season planning, however, the data are integrated with the existing PNHP field data entry database, which allows for seamless transition from the planning phases to the data entry phases of field survey work.

Released in early 2023, FIND PA has already demonstrated that it will be a powerful tool for more efficient and collaborative field season planning. As the first of its kind to provide a comprehensive and centralized location to enter and store PNHP planned survey site data, FIND PA makes it simple to view planned field work for an upcoming season, identify overlapping survey interests, and glean program-wide information about the upcoming planned field season. This spring, FIND PA was used to drive the first ever PNHP-wide field season planning session where biologists shared plans for the 2023 season and identified opportunities for potential collaboration. Moving forward, FIND PA will play an integral role in the process we are undergoing to improve the efficiency of the PNHP workflow pipeline from field season planning to conservation planning products.

Native or Introduced? How Modern Access to Data Changed Our Mind for One Species

Steve Grund, Botanist

Rebekah D. Wallace, University of Georgia, Bugwood.org

Common camphorweed (*Pluchea camphorata*)

Sometimes the decision to treat a species as native to Pennsylvania as opposed to having arrived here because of human activity can be difficult and somewhat subjective. With common camphorweed (*Pluchea camphorata*), it was straight-forward. Twice! The first time the question was approached was in 1990. At that time, what we knew of the occurrences of plants in Pennsylvania was mostly from the direct experience of regional botanists, and the records of past botanists stored as plant specimens, mostly at the Academy of Sciences in Philadelphia, the Carnegie Museum of Natural History, Pennsylvania State University, and several small collections at other universities in the state. The only specimen known of this species had been collected from the garden of the famous early botanist John Bartram. It seemed pretty clear that this plant had come from further south, and its presence in Bartram's garden was not evidence that the species was native to the state.

Fast forward to 2022. At this point, most collections of dried plant specimens (called herbaria) have been scanned, the label data transcribed, and put online where it is accessible to scientists everywhere. It turns out that there is a specimen of common camphorweed at the University of Illinois that was collected in 1892 from along the Susquehanna River in Pennsylvania just before the river flows into Maryland. Since the species is known from a number of sites in Maryland, mostly near the Chesapeake Bay, there can be little doubt now that the species is (or at least once was) native to Pennsylvania. Now the challenge is to show that it still survives and to see if there is anything we can do to ensure that it remains viable here at the northern limit of its range.

University of Illinois

Collected in Pennsylvania in 1892 and housed at the University of Illinois, this specimen of common camphorweed was unknown to us until it was posted online.

New Hire Spotlight: Megan Kresse

Molly Moore, Heritage GIS Coordinator

Megan joined the Heritage team in December of 2022 as the new GIS Technician. After graduating with a bachelor's degree from Allegheny College in the spring of 2022, she worked as a GIS Tech with Western New York Partnership for Regional Invasive Species Management (WNY PRISM) in Buffalo, NY for the summer. Since starting as the GIS Tech with PNHP, Megan has been working on a variety of tasks related to creating and maintaining GIS data and products, developing maps, and performing database management. Megan's favorite aspect about GIS is being able to create maps and products that can be used to make a positive change on our natural world, and she is excited to help make a difference through her work at PNHP. Outside of work, Megan enjoys playing frisbee and pickleball, hiking, and tango.

Megan Kresse

New Project is Next Step in Salamander Mussel Recovery

Ryan Miller, Zoologist

Recently, PNHP was awarded a Wild Resource Conservation Program (WRCP) grant to further study the state endangered salamander mussel (*Simpsonaias ambigua*). The current range of this rare mussel in Pennsylvania is restricted to the Allegheny River navigational pools 3-8 and French Creek; it historically included Dunkard Creek before a recent incident that resulted in an almost complete fish and mussel kill.

Ryan Miller

The salamander mussel is the only North American freshwater mussel known to use an amphibian host, the mudpuppy.

Recent surveys have documented that the navigational pools in the upper Ohio River basin have suitable habitat for the salamander mussel. Besides records in the Allegheny River's navigational pools the salamander mussel was found in the Ohio River in the Belleville Pool approximately 160 miles downstream of the Pennsylvania and Ohio border. One of the main theories for this gap in occupancy of the salamander mussel between the Middle Allegheny and Middle Ohio rivers is legacy pollution causing salamander mussel mortality.

The mudpuppy (*Necturus maculosus*) is the only known host for the salamander mussel. This purely aquatic amphibian with large, external gills has been observed at numerous salamander mussel collection locations in Pennsylvania. Salamander mussel glochidia (larvae) have been observed imbedded on the external gills of mudpuppies. PNHP's mudpuppy studies over the past five years revealed populations with relatively high densities in Pennsylvania's portion of the Ohio River while the salamander mussel remains absent.

Ryan Miller

Mudpuppy

Juvenile salamander mussel survival could be a factor limiting the dispersal and recovery of the salamander mussel. This new WRCP project will study survival of juvenile salamander mussels through the deployment of mussel survival silos. These small, concrete, dome-shaped structures have a chamber in the middle that will hold a small number of juvenile salamander mussels. We will place the silos in five locations in western Pennsylvania that either currently have salamander mussel populations (control) or where salamander mussels are no longer found, like the Ohio River. After leaving the silos out for the summer (one growing season) we will remove the silos and examine the juvenile salamander mussels for survivability and growth. This may answer whether salamander mussels can survive in Pennsylvania's portion of the Ohio River.

Ryan Miller

Mussel silo

Hatchery reared juvenile salamander mussels are being provided from the U.S. Fish and Wildlife Service's White Sulfur Springs hatchery in West Virginia. Last fall PNHP staff collected gravid female salamander mussels from a robust population in the Middle Allegheny River. The females were taken to the hatchery and the juveniles they produced are being returned to Pennsylvania for this study.

If this study finds that juvenile mussel survival is high, it could lead to the next step in recovery, including the repatriation of salamander mussels to the Ohio and other waterways where they are now extirpated as they are in Dunkard Creek. This project will get us one step closer to recovering this rare and unique mussel in Pennsylvania.

Vernal Pool Outreach Milestones

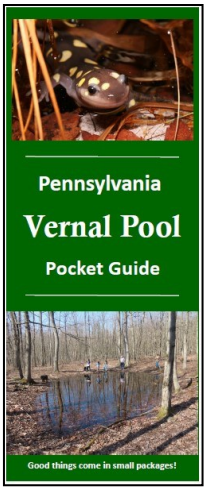
Betsy Leppo, Invertebrate Zoologist

JoAnn Albert

As part of this project, PNHP staff developed management plans for private landowners with vernal pools on their property.

We recently completed work on a 'Vernal Pool and Wet Meadow Outreach' project. During the course of this five year grant, we worked with partners and landowners on the advancement of vernal pool education, inventory, management, and long-term conservation. We gathered ecological data for conservation efforts and provided recommendations that can be used to lessen stressors to these small and fragile wetland habitats from invasive species, forest pests, climate change, timber management, development, and other changes on the landscape.

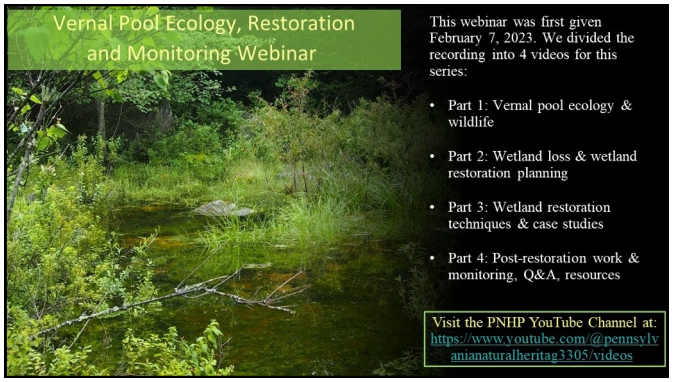
Recent highlights from the project include the development of a new 'Vernal Pool Pocket Guide' that describes vernal pool wetlands and wildlife. This brochure is designed as a pocket-sized trifold to make it more convenient for carrying in the field. Two versions of the brochure are available on the PNHP website (https://www.naturalheritage.state.pa.us/) - go to Ecological Communities > Vernal Pool Communities > Resources. One version of the brochure is designed for digital viewing, and the other is formatted for print copies.



We also hosted a two-hour vernal pool restoration webinar on February 7 in partnership with the Bureau of State Parks, Resource Management. We turned the webinar recording into a four-part series, which can be viewed on the PNHP YouTube Channel. Some interesting questions came from webinar participants, including the following:

- How do vernal pool amphibians find new wetlands?
- How long does a vernal pool need to hold water?
- Will restoring a wetland help with climate change?

These questions are answered as part of the Q&A section of the webinar, and are available to download as a pdf from the PNHP vernal pool website from the vernal pools 'Resources' tab.



A four-part webinar on vernal pool ecology and restoration can be viewed on the PNHP YouTube channel. https://www.youtube.com/@pennsylvanianaturalheritag3305/videos

PNHP has invested in vernal pool research and protection for many years. In the future, we will continue monitoring past wetland restoration sites, which provide many training opportunities as volunteers take increasing leadership of coordinating and running the monitoring programs. In June of 2022 we received a small grant from the GIANT Company / Keep Pennsylvania Beautiful Healing the Planet program to purchase supplies needed for an expanded citizen science monitoring project. This spring we began installing the monitoring stations at fifteen vernal pools in Gifford Pinchot State Park and Kings Gap Environmental Education Center, in partnership with the Master Watershed Stewards of York and Cumberland counties, and the park's Friends Groups.

Our thanks to the dedicated landowners, land managers, volunteers, and other conservation partners, whose energy and enthusiasm fueled this work. This project was funded in part by the Community Conservation Partnerships Program, Environmental Stewardship Fund, under the administration of the Pennsylvania Department of Conservation and Natural Resources, Bureau of Recreation & Conservation.

Choosing Sites for Tiger Beetle Surveys

Pete Woods, Inventory Ecologist

This year PNHP will be starting surveys for three species of globally rare tiger beetles. Spring surveys will focus on Appalachian tiger beetles (*Cidindela ancocisconensis*) and northern barrens tiger beetles (*Cicindela patruela*). This summer we will turn our sights to cobblestone tiger beetles (*Cicindela marginipennis*), whose adults become active in July. In preparation for the field season we have been choosing the sites where we will search for tiger beetles.

Pete Woods

Ben Coulter

Ben Coulter

Appalachian tiger beetle (top), northern barrens tiger beetle (middle), and cobblestone tiger beetle

In general, tiger beetle habitats have very sparse vegetation, which allows the long-legged adults to run down their prey. But each of these three species has different habitat needs, so choosing sites to survey requires a different method for each species. Cobblestone tiger beetles live on medium to large rivers, where ice scour produces bare cobblestone bars on the upstream end of islands. Finding these habitats on aerial photos is straightforward.

Pete Woods

This lightly vegetated sunlit patch of sand on the edge of Laurel Hill Creek is habitat for larvae and adults of the Appalachian tiger beetle.

Northern barrens tiger beetles live in uplands in areas with bare, sandy soils. In modern Pennsylvania, the best place to find this kind of habitat is in unreclaimed surface mines. Finding such areas is easy on aerial photos, but a field visit is necessary to determine if the substrate is right for this species. If the substrate is too fine for northern barrens tiger beetles, other species of concern, such as the splendid tiger beetle or the cowpath tiger beetle, may be present.

Appalachian tiger beetles live in sand or sandy loam deposits on the edges of medium to large creeks. These habitat patches can be just a few square meters, and are not visible from aerial photos. These sandy deposits are created by floods that drop sediment on a creek's floodplain, and it can be hard to predict which creeks will produce these sand patches. We might expect dam-free creeks with unimpeded flood regimes to generate the most sand deposits, but several of our known sites are downstream of impoundments, so while dams may affect habitat quality they do not necessarily prevent these beetles from persisting. We also expect sediments to be sandier near creeks that are not encumbered by siltation from disturbances such as agriculture and development. So, creeks in less disturbed watersheds should generally have less silt and more sand.

We have one final method for finding Appalachian tiger beetle habitat. We simply go to creeks with the word "Sand" or "Sandy" in the creek name. You might think this method is not scientifically rigorous, and you might be right, but in the past, we have found this method to be surprisingly successful!