



# Pennsylvania Natural Heritage Program

information for the conservation of biodiversity

## WILD HERITAGE NEWS

Fall 2023



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### Photo Banner

Taiga bluet (*Coenagrion resolutum*) male

Clark Shiffer

### Scanning a Legacy Slide Collection for the Future

by

Betsy Leppo, Invertebrate Zoologist

### Watching Over Pennsylvania's Dragons

Dragonflies and damselflies are beautiful, beneficial insects that control pest insects and feed larger predators such as birds and fish. As larvae they inhabit freshwater systems and many species require specialized habitats like bogs, fens, and seepage wetlands. Unfortunately, odonates have become one of the most imperiled groups of animals in North America.



Clark Shiffer, 1999

Mr. Clark Nelson Shiffer worked as an aquatic biologist and the Herpetology and Endangered Species Coordinator for the Pennsylvania Fish and Boat Commission

from 1967 to 1993. He was interested in all kinds of plants and animals, but especially enjoyed damselflies and dragonflies. These closely related insects are in the Order Odonata and are

commonly called "odes." Clark spent many decades observing, collecting, and photographing the odes he encountered in the streams and wetlands of Pennsylvania.

The depth of Clark's fascination with odonates is evident in his study of Ten Acre Pond, a large seasonally fluctuating wetland in Centre County. Clark and several colleagues monitored the dragonfly diversity of this site for 56 years (1955-2011), the longest published study of dragonflies at a single habitat in the U.S. Clark authored or coauthored ten other publications on odonates in Pennsylvania. A full list of his work is provided by his friend and collaborator Hal White in a



Ten Acre Pond

Betsy Leppo

memorial article in the June 2017 edition of *Argia*, a publication of the Dragonfly Society of the Americas.

### From Paper and Celluloid to Bits and Pixels

Clark kept detailed records of his odonate observations starting in the early 1970s. He added them to paper logbooks that were first kept by George and Alice Beatty when they were professors at Penn State University. The logbooks include their own records, along with data gathered from museums and researchers across the state. The logbooks eventually accumulated an estimated 30,000 records, some of which date back to the 1800s. From 2003-2006, PNHP digitized over 13,000 records from the logbooks into the Pennsylvania Odonate Database, prioritizing entry of records for rarer species. Digitizing these paper records made them searchable and shareable.



Clark Shiffer

Clark was the first to document five species of dragonflies in Pennsylvania, including the incurve emerald (*Somatochlora incurvata*).

Clark also preserved voucher specimens and photographs. Clark's specimen collection was donated to the Florida State Collection of Arthropods in Gainesville, which houses one of the largest Odonata collections in the world. The future of his extensive slide collection was less certain. The transition from printed film to digital photography took place during Clark's lifetime, with digital cameras becoming increasingly common from the mid-1990s to the mid-2000s. But Clark was invested in film and never gave up his trusty Olympus 35mm camera.

In 2018, Clark's family gave a portion of his odonate slide collection to PNHP. These slides were selected by Clark as being the best or most representative images of the species he photographed. We recognized the



Clark Shiffer

Seepage dancer (*Argia bipunctulata*) pair. This damselfly is a Species of Greatest Conservation Need.

effort and expertise Clark invested in capturing thousands of images of live dragonflies and damselflies in the wild. But we also knew the photos would not be utilized if they could not be shared digitally. Through this project, we digitized 2,553 of Clark's slides that documented 163 out of 175 of Pennsylvania's odonate species. Clark's photos capture many of our rarest species, and highlight unique species behaviors or characteristics.

We documented the data associated with each slide in an Excel spreadsheet to ensure maximum searchability for species, dates, locations, and content. We labeled and tagged each image file with the corresponding information. Images with a corresponding record in the Pennsylvania Odonate Database were cross-referenced in the spreadsheet. We mapped the locations of survey sites into an ArcGIS layer that was originally developed



Clark Shiffer

Clark's collection highlights interesting behaviors, such as this female black-tipped darner (*Aeshna tuberculifera*) ovipositing.



## A Sampling of the Clark Shiffer Archives



Comet darner (*Anax longipes*)



Violet dancer (*Argia fumipennis violacea*)



American rubyspot (*Hetaerina americana*)



Lyre-tipped spreadwing (*Lestes unguiculatus*)



Gray petaltail (*Tachopteryx thoreyi*)



White-faced meadowhawk (*Sympetrum obtrusum*)





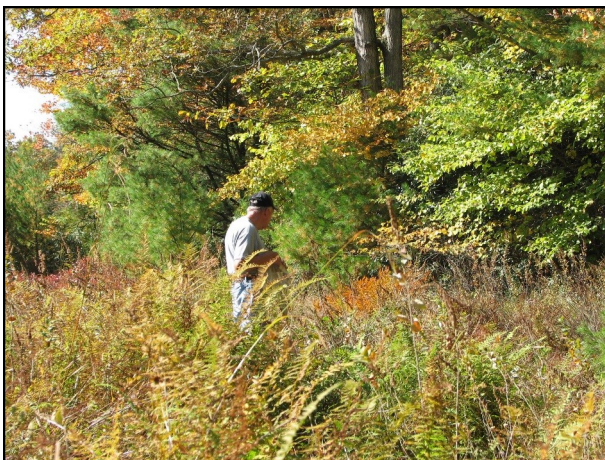
Clark Shiffer

Based on the number of photos he curated in the collection, Clark's favorite damselfly was the great spreadwing (*Archilestes grandis*) with 51 slides.

for the PA Odonate Database. Each scanned image was checked and 'cleaned' to remove dust marks and other blemishes. Finally, the digitized images were shared with Odonata Central (<https://www.odonatacentral.org/#/>), an online repository for photos and data, where they will be made publicly available and searchable under the user name "Clark Shiffer Archives."

### Thank-you

We are grateful to the Shiffer family for sharing their father's slides and their stories with us. We couldn't have done this project without Sally Ray, who volunteered nearly 45 days scanning, databasing, and touching up slide scans. Our thanks to Odonata Central for working with us to get the photos online where they can be easily accessed. We thank the Wild Resource Conservation Program for funding three grants to preserve these data and images. Clark was instrumental in the development of the Wild Resource



Betsy Leppo

Clark Shiffer at Beaver Dam in Huntingdon County.

Conservation Act which supports conservation of Pennsylvania's flora and fauna. It is fitting that Wild Resource funds helped to make these resources available to researchers, natural resource managers, and the public for use in research, education, and conservation.

### When Your Parent is a Field Biologist

Clark sometimes took his three children, Tom, Curtis, and Joan, on dragonfly excursions. They learned to endure the heat, insect bites, sucking mud, and fear of getting lost in the wilds. They agreed that, "You knew when you went out with Dad, you were out the whole day. There was no whining and if you did whine and want to go home early, it did not matter. We'd stay until the sun was beginning to set or it rained." Curtis recalls one survey in Florida that did end in haste when they encountered a huge free-ranging Brahma bull. His father's advice was "Pull your knees up to your belt loops and RUN!!"

The kids learned a lot while out with their Dad. Joan remembers how Clark taught her to quickly but gently net and secure an insect so it could not escape. Tom dispelled a myth about dragonflies when he was just in first grade. He recalls how "a dragonfly got into my classroom and was bouncing off the windows trying to get out. The teacher and kids all freaked out and ran to the other side of the room. I calmly walked over and caught the dragonfly with my fingers and held it up for all to see. The teacher screamed that it could sting me with its tail, and I told her it was an abdomen, not a tail, and it could not sting. I then released the dragonfly out the open window. The teacher was really mad at me. The next day, she held a lesson about dragonflies. She had looked up the information about them and told the class I was right; dragonflies could not sting you and were harmless."

### About the Author

Betsy Leppo has worked with the Pennsylvania Natural Heritage Program for over 25 years and since 2005 as an Invertebrate Zoologist. Betsy conducts surveys for terrestrial and aquatic invertebrates, maintains in-house specimen collections and databases, and develops conservation recommendations for species and habitats.





## Globally Vulnerable Tiger Beetles of Pennsylvania

by

Pete Woods, Invertebrate Zoologist

PNHP biologists have completed the first year of a two-year study of three of Pennsylvania's tiger beetle species. The Wild Resources Conservation Program funded this study because these three species are globally vulnerable and may be declining in Pennsylvania. These species include the northern barrens tiger beetle (*Cicindela patruela*), the Appalachian tiger beetle (*Cicindela ancocisconensis*), and the cobblestone tiger beetle (*Cicindela marginipennis*). A fourth vulnerable species, the ghost tiger beetle (*Ellipsotera lepida*) was once known from Presque Isle, but over the years we have come to believe that species is no longer in Pennsylvania. The goals of this study are to find new populations of these species, to improve our knowledge about the spatial extent of both old and newly found populations, to understand the threats and management needs of each population, and to re-assess the conservation status of these species in Pennsylvania.

### What the Heck is a Tiger Beetle?

Among Pennsylvania's many creatures in the half inch size category, tiger beetles are perhaps the most ferocious predator. Their large eyes let them see prey from far away, and their long legs give them the speed to run down any prey that cannot fly. There are 16 (possibly 17) species of tiger beetle currently living in Pennsylvania.



Pete Woods

Looking into the mandibles of this cobblestone tiger beetle helps you see why tiger beetles were named after one of the largest land predators on earth. Luckily, tiger beetles are not aggressive toward humans, unless you are holding one, and even then they are usually unable to break the skin.

Tiger beetle larvae are just as predatory as the adults, but with a different hunting strategy. The larva will sit at the mouth of its burrow, with its round thoracic shield fitting exactly into the opening of the burrow and camouflaging it. When a small invertebrate walks by, the larva ambushes it and drags it into the burrow. Two dorsal hooks, visible toward the back end of the larva, help anchor the larva in the burrow.



Pete Woods

Tiger beetle larva

Documenting a tiger beetle requires a good photo, which is challenging to take because usually they flush and fly away if you walk within 10 feet of them. But if you crawl on your belly, and move very slowly, you can sometimes get close enough to take a photo. The other method is to catch one to take a closeup photo. Sometimes I have been without a net or adequate camera, and then I try to creep up on the beetle, slap my broad-brimmed hat over it before it flies, and grab the beetle with my hands. But if I have a net, my usual method is run up to it and swing the net over the spot where it is sitting. If (and this is a big if) my swing is timed to match the tiger beetle's takeoff, I catch it.

PNHP contracted entomologist Ben Coulter to help with this project. Ben has found more populations of rare tiger beetles in Pennsylvania than anyone else, and he discovered our only known extant population of cobblestone tiger beetle. He is, to the best of my knowledge, the only person who has seen all of Pennsylvania's extant tiger beetle species in Pennsylvania (unless that 17<sup>th</sup> species really is here).



Pete Woods

Ben Coulter searching for beetles in a patch of cobblestone scour on an island

Ben is experienced at recognizing tiger beetle habitat and identifying tiger beetles from a distance, and his beetle netting skills are superior to mine.

### General Habitat Needs

The tiger beetle hunting strategy relies on distance vision and fast running, which works better in open habitats with sparse vegetation. Different species of tiger beetle have preferences for different types of open habitat. A few, such as the ubiquitous six-spotted tiger beetle (*Cicindela sexguttata*), are generalists that can use a wide range of habitats. Most other species, including those targeted in this survey, need very specific types of substrate, such as sand, clay, or cobbles. But in Pennsylvania, many types of barren or sparsely vegetated habitats are uncommon to rare and only occur where there is an appropriate disturbance regime to set back succession. Without the right sort of disturbance, a site will eventually become overgrown and will not be able to support tiger beetles.



Ben Coulter

Appalachian tiger beetle habitat

### Northern Barrens Tiger Beetle

If you see a bright green tiger beetle with white dots, it is most likely the ubiquitous six-spotted tiger beetle. But if the white marks are longer, or if the green is mixed with bronzy-red undertones, look closer, because you might be looking at a northern barrens tiger beetle.

This species lives in barren uplands with sandy soils, a habitat that can be provided by several types of human disturbance. Some of Pennsylvania's populations of this species are in old rock quarries, sand pits, and other unreclaimed surface mines, where a lack of soil prevents plant growth. One beetle was found on a gas well pad, although we are not sure if that is a real population or if it was a stray individual. Other populations live on rights-of-way that cross dry ridgetops. In West Virginia, this species is known from shale barrens, but in Pennsylvania we have not yet found any in this habitat.



Ben Coulter

Northern barrens tiger beetle

Fire may have once played a role in maintaining habitat for this beetle, and this species probably became more common here in the 1800s and early 1900s after the clearcutting of forests and subsequent soil erosion. As forests recovered, old surface mines probably became a more important habitat, and this presents a conundrum because modern best management practices require the reclamation of such mines by topping the site with soil so that it can revegetate. This practice produces many benefits, but excludes northern barrens tiger beetles from the site.



## Appalachian Tiger Beetle

This beetle lives on riverside sand deposited by floods. The sand doesn't have to be pure loose sand; a sandy loam is acceptable to this species. Unlike the other two beetles discussed here, this one can live on very small patches of habitat, as long as there are additional patches scattered along the river.



Pete Woods

The white marks on a brown background are very similar to some of the common species in the same habitat, but the iridescent metallic colors on the legs help distinguish the Appalachian tiger beetle from the others.

PNHP's database contained records of seven populations of the Appalachian tiger beetle. We visited some of these, and surveyed upstream and downstream of known points, stopping every few miles to search for beetles. We found that these populations extended much farther along the river than we had previously known.

We also selected and visited a number of new rivers to search for the beetles. In our old zoology paper files, I found an ambiguous handwritten note from someone's telephone conversation in 1985, suggesting that this species might have once been found in a particular state park. I visited the park, and found an extensive population throughout and beyond the park. Another river yielded a previously unknown population. Before this project, we assumed that only 4<sup>th</sup> order and larger streams could support this species, but now we have learned that 3<sup>rd</sup> order streams are also capable of hosting this beetle.

The open sand that the beetles rely on is only deposited when a river floods over its banks. When a river is dammed, the natural flood regime is suppressed, and habitat-building floods happen less often. Several of our populations (or is it one large population?) are on

creeks below dams. It is noteworthy that these are able to persist, although the quality of these populations has not been determined. Another threat to these beetles is invasive plants. One of our known sites had been heavily invaded by Japanese knotweed (*Fallopia japonica*) since it was last visited, the open sand replaced by a thicket of weeds, and the beetles were gone. Another plant that might create problems for Appalachian tiger beetles is Japanese stiltgrass (*Microstegium vimineum*). This plant can grow thickly on open riverbanks and can spread rapidly. At this point, only one of our sites is infested with stiltgrass, and we are not sure how the beetles will fare at that site.

## Cobblestone Tiger Beetle

Cobblestone tiger beetles live on large rivers, usually on islands. The upstream ends of these islands are scoured by floods carrying ice and other debris, which scrapes off the vegetation and fine sediments, leaving bare pebbles and cobbles.

There used to be a number of populations of cobblestone tiger beetle in Pennsylvania, but they have disappeared over time, probably because of dams that subdued the natural flood regime, and had not been seen since 1960. Without floods of appropriate intensity, scouring does not happen, and vegetation grows up making the habitat unusable for the beetles. Because the beetle has declined across much of its range, the U.S. Fish and Wildlife Service considered listing it as a threatened species, but in 2019 they decided the declines were not severe enough to warrant listing.



Pete Woods

This cobblestone tiger beetle is avoiding overheating by "obelisking," pointing the long axis of its body toward the sun to minimize the direct light it absorbs. This species has even longer legs than the other species discussed here.



Perching on top of a cobble gives a tiger beetle a better view of the neighborhood

Pete Woods

PNHP suspected that the species was extirpated from Pennsylvania until 2012, when Ben Coulter found a population on a river island. Since then, Ben and PNHP staff have occasionally searched other islands in the same river system on their own time, but this WRCP grant provided an opportunity to do a much more systematic

survey of the region. When we returned to the 2012 site, we found that vegetation had grown up over the previous decade, covering much of the formerly sparsely vegetated cobblestone habitat, and we were unable to find any cobblestone tiger beetles there. Fortunately, we found a healthy population of the beetles at three adjacent islands. But further surveys in this river system and others yielded nothing beyond this one island cluster. It is possible that this is the last remaining population in Pennsylvania, although there are still many potential sites we have not yet visited, but our surveys have reinforced the conclusion that this beetle is critically imperiled in Pennsylvania.

One of the greatest threats to this species is from dams, which suppress floods and thus reduce scouring. To some extent, this can be alleviated by releasing occasional pulses of water to mimic natural floods. The other major threat to cobblestone tiger beetles is



Pete Woods

Bare stones and sparse vegetation, high enough to avoid frequent flooding, provide good habitat for cobblestone tiger beetles.

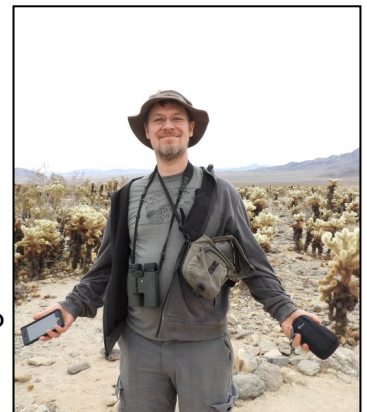
warmer winter temperatures, which reduce river ice, the main scouring agent. However, another predicted effect of climate change in this region is increased winter and spring precipitation, which could lead to more flooding events, and which may partially offset the effect of reduced ice.

### In a Nutshell

For northern barrens tiger beetle and Appalachian tiger beetle, the more we look, the more we find. These species are rare in the state, but for the time being, not critically imperiled. For cobblestone tiger beetle, we delineated the extent of our one known population, and failed to find additional populations. Our work has reinforced the conclusion that this beetle is critically imperiled in Pennsylvania, and its future here is uncertain.

### About the Author

Pete Woods joined PNHP in 2007 as a County Inventory Ecologist working mostly with rare plants, and gradually spent more and more time working with insects until he transitioned into his current role as Invertebrate Zoologist. He received his B.S. in Biology from Cornell University, and his M.S. in Wildlife and Fisheries Biology from the University of Vermont.





## Notes from the Field

### Have You Heard? We're Working to Protect Eared False Foxglove

Rachel Goad, Botanist

Eared false foxglove (*Agalinis auriculata*) is an annual plant that is globally vulnerable and at the northeastern edge of its range in Pennsylvania.

Historically known from fewer than 20 locations in our state, only one is known to remain. Former populations have been lost to mining, development, and likely other landscape scale changes. Our remaining population is threatened by invasive species, which are annually managed by PNHP, as well as by animal browse. Over time, we've observed that many plants are browsed after flowering but before they can set seed. For populations of annual species, being able to successfully set seed is critical to their persistence.



Eared false foxglove in flower

Rachel Goad



Installation of cages should protect plants from being browsed and allow them to set seed.

Rachel Goad

Although PNHP botanist John Kunsman has been annually monitoring this species and conducting ecological stewardship to maintain its habitat for more than 35 years, this year we began to intensify our efforts to understand these plants and their threats. With support from the Pennsylvania Plant Conservation

Alliance, we collected leaf material to share with a research collaborator who is investigating the genetics of our population, and we installed cages to protect a subset of plants from browsing. We will revisit to find out if they are effective at excluding the browsing animals (whose identity is so far unclear). We also installed game cameras to see if we can observe the wildlife that might be responsible for the browse. In the first month of our new game cameras being deployed, we observed deer, hawks, and a smattering of other birds frequenting the site.

### Thinking Inside the (Nest) Box: Novel Methods in Eastern Hellbender Research

Natalie Niemeyer, Conservation Information Assistant

Devil dog, snot otter, lasagna lizard, Allegheny alligator, mud devil, and grampus are just a few of the bizarre nicknames our Pennsylvania state amphibian has earned over the years. Despite these ghoulish epithets, the elusive eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*) is harmless to humans and serves as an important indicator species in freshwater stream ecosystems. These fully aquatic salamanders breathe through their lateral skin folds, which makes them particularly sensitive to pollution, excess sediment, and reduced oxygen levels in the water. Therefore, they prefer to inhabit cold, clear, fast-flowing streams.



Eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*)

Ryan Wagner

Hellbenders have a long lifespan of 25+ years and can reach a whopping 2½ feet in length, making them the largest salamanders in North America. They tend to stay in the same place, exhibit low recruitment rates,

and are slow to mature, reaching reproductive age in 5-8 years. Consequently, they are exceptionally vulnerable to local extirpation.

Eastern hellbenders face an extensive list of threats, both natural and anthropogenic, including unsustainable collection, poaching for the pet trade, killings by fishermen, pollution, siltation due to agriculture and erosion, disease, predation, water withdrawals for shale gas developments, and manipulation of waterways through damming, channelization, channel rerouting, and rock removal. These pressures have led to habitat loss and subsequent decline of hellbender populations throughout their range since the 1970s. PNHP ranks the eastern hellbender as “imperiled” (S2S3) in the commonwealth.

Matthew Kaunert, hellbender biologist and Director of the Clean Water Institute at Lycoming College, has been studying eastern hellbender populations in western Pennsylvania since 2018. His research aims to shed light on the hellbender’s mysterious reproductive ecology and the mechanisms driving population decline in order to support conservation efforts. Kaunert’s study mainly revolves around the deployment and monitoring of 180 artificial nest boxes at ten reaches across three streams in the region where hellbender populations were either stable or declining. Declining populations consist of mostly larger, mature individuals, with a lower occurrence of small size classes and larvae.

The study sites were carefully chosen based on historical surveys conducted by the Western Pennsylvania Conservancy and Clarion University. The nest boxes are roughly 90 lb. concrete boxes equipped with an entrance tunnel and nest that mimic the large rocks under which eastern hellbenders prefer to dwell. These manmade nest boxes also have detachable lids



Matt Kaunert

Eastern hellbender occupying artificial nest box.

and are equipped with underwater video cameras to monitor conditions and behavior within the nest. Kaunert and his team checked the nest box arrays every 1-2 weeks from May to August to document occupancy. During the hellbender nesting season, which spans from August to December, the nest boxes were monitored more frequently to observe and record reproductive success, paternal care behavior, and egg/larval survival.



Matt Kaunert

“Den-master” male hellbender guarding egg mass in artificial nest box.

Another important facet of Kaunert’s research involves the collection of hellbender egg masses to study conditions affecting their survival and development. In environmental chambers at Ohio University, master’s students Ryan Brown and Sam Mathes manipulated factors including water temperatures, dissolved oxygen levels, and conductivity to reflect the environment of natural hellbender nests. In the wild, nest-attending males, aptly dubbed “den-masters,” stay with their young for about 7-8 months. During this period, they guard their nests against predators and frequently agitate developing eggs, to supply oxygen and stop yolk adhesion, which in turn, increases survival rates of their offspring. In the lab, eggs were routinely agitated to imitate these unique paternal care behaviors. Upon completion of the experiment, the larvae were released at the site of collection.

Kaunert’s research effort was covered under a Scientific Collector’s Permit with the Pennsylvania Fish and Boat Commission as well as permits for adding the nest boxes to streams. Data from his efforts are reported to PFBC and PNHP. Kaunert’s recent findings helped to keep PNHP records of extant hellbender populations up-to-date, track changes in population density over time at different sites, and advance our understanding of known distributions of the species throughout western Pennsylvania.



## River Systems of Pennsylvania – Highlighting the Genesee River

Mary Ann Furedi, Ecological Assessment Manager

Over the last 20 plus years, PNHP ecologists have been working to understand the composition and distribution of plant communities associated with the river systems of Pennsylvania. Currently, we are completing a project that focuses on floodplains along the Potomac, Genesee, Lehigh, and Schuylkill rivers. Our work not only involves visiting the rivers and collecting plant community related data, but also entails research to understand the geology, historical significance, and past and present uses of these systems. This background information often helps explain some of the floodplain patterns and species composition we document in the field. It also gives us an opportunity to learn some cool details about the places where we work.

Here are some interesting facts we learned about the Genesee River.

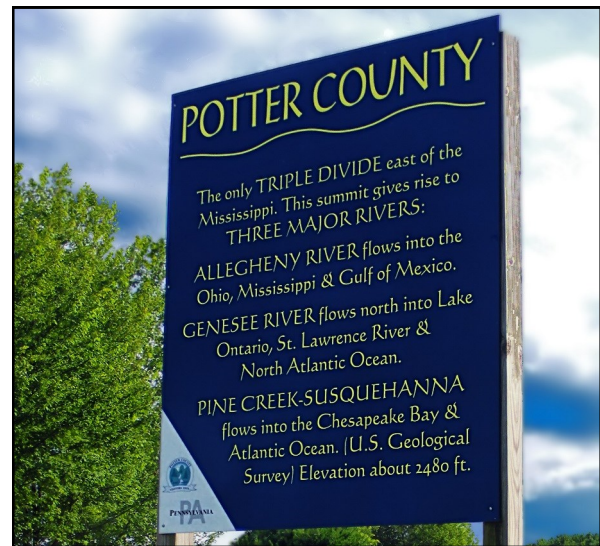
- The Genesee River is a 157 mile long tributary of Lake Ontario.
- The name Genesee is derived from a Seneca word most commonly interpreted to mean “pleasant valley.” The Seneca nation traditionally lived between the Genesee River and Canandaigua Lake.



Mary Ann Furedi

Floodplain characterization work being done along the headwaters of the Genesee River in Pennsylvania.

- The river begins as a tiny headwater spring on a hilltop in Gold, Pennsylvania (Potter County) where it flows for 11 miles before crossing into New York.
- The headwaters of the Genesee, the Allegheny River, and Pine Creek (West Branch of the Susquehanna) all arise within a short distance of the triple continental divide in Potter County. This is the only triple divide east of the Mississippi.



Nicholas A. Tonelli

Triple Divide sign at the junction of Rooks Road and PA Route 449 in Potter County.

- Depending on where a raindrop falls in Gold, Pennsylvania, it may end up in the Chesapeake Bay, Gulf of Mexico, or Lake Ontario.
- Water flows downhill so we generally think of rivers as flowing north to south. The Genesee River is different in that it flows in a south to north direction beginning in Pennsylvania, traveling through Rochester, New York, and emptying into Lake Ontario.
- The most famous section of the river runs through Letchworth State Park in New York, where the river has carved a gorge approximately 600 feet deep and is known as the “Grand Canyon of the East.” Not only are there spectacular waterfalls to view but you can also see the amazing geologic history that has been uncovered over time.



James St. John

One of the stunning waterfalls of the Genesee Gorge at Letchworth State Park in New York.



## Natural Heritage Field Work Assesses Land Protection Opportunity

Charles Bier, Senior Director Conservation Science

The PNHP staff works hard to collect and manage the huge treasure trove of information that consists of element occurrences, natural heritage areas, and associated datasets. Most people typically think that the utility of these datasets is to review highway, mining, and other development projects. However, another key use of PNHP data is to guide the land and water protection efforts of conservation organizations by adding a biodiversity significance assessment to potential land acquisition projects. An example of this facet of PNHP work took place this past autumn on the western flank of Chestnut Ridge, near Uniontown in Fayette County, where the Western Pennsylvania Conservancy is involved in an opportunity to protect a 758-acre parcel of raw mountainside land.

Here, once again, landscape geology is crucial to understanding biodiversity and the unique habitats of the Allegheny Mountains ecoregion. In this case, certain portions of these mountains are dominated by Pottsville Sandstone outcrops and boulder fields on the surface. These habitats are central to several species of concern, including green

salamander (*Aneides aeneus*), Allegheny woodrat (*Neotoma magister*), Appalachian gametophyte fern (*Vittaria appalachiana*), and some bats, such as eastern small-footed bat (*Myotis leibii*), among other flora and fauna.

In addition to existing element occurrence data, an analysis of surface geology, aerial photography, and digital LIDAR mapping provided an initial assessment of potential habitats to investigate. In the case of the property in question near Uniontown, the analysis was encouraging for rock dependent species. Furthermore, it turned out that a 1986 PNHP field survey had discovered rock habitats at this site, but could not fully evaluate what was living there.



Mountain spleenwort (*Asplenium montanum*) is a small obligate rock-dwelling fern which was found on cliffs and large boulders of hard sandstone.

Charles Bier



Charlie Eichelberger investigates a Pottsville sandstone outcrop for species of special concern.

Charles Bier

This past autumn, Charlie Eichelberger, PNHP Vertebrate Zoology Manager, and I spent 3 days in the field to evaluate this tract. The field studies are not complete as this newsletter goes to press, but so far evidence of the Allegheny woodrat has been discovered and suitable habitat for the green salamander is present. One big

brown bat (*Eptesicus fuscus*) was found to be resting in a cliff crevice. If this property is acquired, it will likely become part of Forbes State Forest for future stewardship of these unique habitats.

## Recap of 2023 Take A Hike and Scavenger Hunt Survey Events

Amy Jewitt, PA iMapInvasives Program Coordinator

In my current role as the PA iMapInvasives Program Coordinator, I often get asked the question, "What do you think people can do to prevent the spread of invasive species?" I'm certain this question could be answered any number of ways depending on your own unique perspective of the problems associated with invasive species. However, my go-to response always focuses on one particular action: **education**.

In the trainings we do for iMapInvasives and invasive species, I always point to the importance of education. Without knowledge of a particular subject matter, we are essentially blind to it or think we know something about it when in fact that may not be true. Therefore, I feel it is incredibly important to increase our own awareness of the presence of invasive species by using tools like iMapInvasives to understand which species are already in our region or approaching it, and then use existing resources like online field guides, fact sheets, etc., to learn how to identify these species in the field. Additionally, reporting your findings using a tool like iMapInvasives can help land managers and others know about a species' presence in an area and hopefully lead to efforts to treat/manage it, and in some cases, prevent its further spread.



To continue promoting awareness and education of invasive species in Pennsylvania, especially species considered to be emerging (new) invaders, we host two events each year that encourage community scientists and others to get out in the field and survey for specific species. In July of this year, we hosted a new event called “Take A Hike, Spot An Invasive, Map Your Findings,” and in August, we hosted the “Invasive Species Scavenger Hunt” which is now in its fourth year.

Each event has similar goals:

- Encourage participants to search for invasive species occurrences found in natural areas throughout Pennsylvania.
- Focus participant surveys on specific invasive species, both common and emerging invaders in Pennsylvania. (“Take A Hike” – 2 species/county; “Scavenger Hunt” – 10 species/statewide)
- Increase the amount of data available in iMapInvasives for use by natural resource professionals, land managers, and others across Pennsylvania.
- Aid participants in recognizing the proliferation of common invasive species throughout the commonwealth and encourage participants to be on the lookout for newly emerging species.

This year, the “Take A Hike” event attracted 25 participants, and the Scavenger Hunt boasted 35 participants. Webinar trainings aided participants in knowing what they needed to do in order to participate, and at the end of each event, prizes were awarded to a select number of qualifying participants.

Additionally, this year’s Scavenger Hunt event received news media attention across western Pennsylvania in an article written by Julie Grant, Managing Editor and



Julie Grant / The Allegheny Front

Faculty and students from Penn State Behrend searching for mysterysnails in Lake Erie at Presque Isle State Park.

Reporter for the Allegheny Front. Titled “Hunting for Invasive Snails in Lake Erie,” this story highlighted the efforts by faculty and students at Penn State Behrend to search for lesser known invasive animals called mysterysnails. Their survey efforts overlapped with participation in the 2023 Scavenger Hunt as mysterysnails were one of the ten species on this year’s species checklist.

### Piping Plover Restoration

Ephraim Zimmerman, Science Director

This year marked the 7<sup>th</sup> consecutive successful breeding season for piping plovers in the Gull Point Natural Area at Presque Isle State Park! <http://tinyurl.com/42fkjye7>.



Piping plover

Vince Cavallieri, USFWS

The success of the program is due to a massive collaborative effort across the Great Lakes, including state and federal agencies, universities, and conservation organizations. The Pennsylvania efforts are coordinated by the Pennsylvania Game Commission in partnership with the U.S. Fish and Wildlife Service, DCNR Bureau of State Parks (Presque Isle), Western Pennsylvania Conservancy, and Erie Bird Observatory.

In Pennsylvania, PNHP continues to contribute to the program by supplying high resolution aerial imagery prior to the arrival of plovers in the spring, and fall imagery to document the extent of shrubby vegetation in the plover’s critical habitat area. Sometimes “droning the Point” is thwarted by late season lake ice, high winds, or poor weather conditions, and we don’t get the best imagery – but this year, we had two perfect days in March and September and obtained great aerial imagery!

In the fall, PNHP typically works with the Presque Isle State Park’s Resource Management Division to control invasive and unwanted vegetation in the critical habitat



Brian Gula, Bureau of State Parks

Tom Cermak, Pennsylvania Sea Grant Coastal Outreach Specialist, applying a wetland-approved herbicide mixture to control cottonwood seedlings within the piping plover recovery area.

area. Non-native common reed (*Phragmites australis*) and purple loosestrife (*Lythrum salicaria*) are the major invaders, but also a number of native-fast growing trees and shrubs – willows (*Salix* spp.) and cottonwood (*Populus deltoides*) are also targets as dense shrub thickets provide cover for predators like raccoons and coyotes. The invasive tree of heaven (*Ailanthus altissima*) was documented for the first time in the critical habitat area. This reinforces the idea that invasive plant control will be an important long-term activity as we continue to manage habitat for the piping plover.

### Recent Outreach Events Promote Old Growth Forests

Jaci Braund, Ecologist

Collaboration opportunities for old growth forest research have recently taken an upswing and PNHP has participated in three meetings and outreach events in Maryland, Pennsylvania, and New Hampshire – all in the month of September!



Late-Successional Forest Workshop participants

The first meeting was hosted by The Nature Conservancy (TNC) of the Maryland/DC region in early September in western Maryland. The

purpose of the field meeting was to foster collaboration between natural resource professionals in the region on late-successional forest management. The TNC staff

coordinated this field meeting at Dans Mountain Wildlife Refuge to show an old growth forest and discuss prescribed burn management plans. I presented on the old growth rapid assessment and summarized relevant old growth forest characters to about 25 people during one of the concurrent sessions. The previously outlined session objectives from TNC were to introduce and discuss forest structural attributes that define desired late successional conditions, lead a conversation on the ecological significance of desired late-successional conditions, and consider the preferred range of conditions for these attributes in different forested ecosystems. The group was a mix of TNC staff, private consultant foresters, and state natural resource professionals. All were engaged with many questions and provided excellent feedback on the rapid assessment methods and old growth management.



Ephraim Zimmerman

Dale Luthringer (Cook Forest State Park) and Jaci Braund (PNHP) discussing old growth forest characters to DCNR and PNHP staff at Ricketts Glen State Park.

Heritage staff presented on our old growth forest work in Ricketts Glen State Park at a meeting with DCNR Secretary Cindy Dunn, Assistant Secretary John Norbeck, and staff from the DCNR Executive Office, DCNR Bureau of State Parks, and PNHP. The meeting focused on climate change work in action, and since old growth forests are carbon sinks, this was a great opportunity to showcase our efforts. After I introduced the project and provided background information, Invertebrate Zoologist Betsy Leppo led the group out to see the invertebrate traps that were installed at the park earlier in 2023. Along the way, we pointed out old growth forest characteristics, facilitated discussions on old growth forest management, and answered questions. We had prepared specimen containers to show the group and explained the purpose of surveying for associate wildlife species within old growth forests. Avian Ecologist David Yeany and Botany Manager Scott



Schuetz also sent along talking points which were shared with the group while discussing old growth associate species. Participants all engaged in old growth discussions the entire meeting and it was a wonderful opportunity to talk about the significance of our work and our project goals.

I also participated on a panel discussion with other northeastern Heritage biologists at the Eastern Old Growth Conference in New Hampshire at the end of September. The conference drew 250 participants that ranged widely from academics and natural resource professionals to hobby big tree hunters. PNHP biologists collaborated via email over the past several months to prepare questions and slides on how our state programs track old forests, what technology is used, and how we are able to influence the conservation of old growth in our respective regions. The conference was a unique blend of science, art, and climate change topics. Many attendees were supportive and interested in old growth work being conducted in Pennsylvania, and this conference was a valuable opportunity to meet researchers and make connections to advance the old growth project.

### Limestone Run

Ephraim Zimmerman, Science Director

Sometimes sites just have that “It Factor!” and Limestone Run is one of them. This small tributary to Dunbar Creek in Westmoreland County is a biodiversity hotspot in the Laurel Highlands. Tucked into a corner of State Game Lands 51 near Dunbar, Pennsylvania, this tributary is fed by limestone-rich spring seeps high up in the watershed, beneath a capstone of Pottsville Sandstone creating a rich, moist-forest ecosystem surrounded by dry, acidic ridgetop forest and bouldery cave-like rock-houses.



Brian Daggs

Rich forests along the Limestone Run floodplain support a number of rare and important plant species that take advantage of the calcium-rich moist soils.



Jessica McPherson

Sugar Maple – Basswood Forest supporting glade fern, wood nettle, and mountain bugbane, covers the rich lower slopes of the Limestone Run valley.

The water, which flows out of the Loyalhanna Limestone, feeds the rich flora in the lower slope of this mesic cove-like community of sugar maple and basswood. Several rare species of plants are found in this creek valley, typical of rich mesic Appalachian coves – species like Goldie’s fern (*Dryopteris goldiana*), mountain bugbane (*Actaea podocarpa*), and the recently discovered purple sedge (*Carex purpurifera*) found by Jessica McPherson and described in the last issue of Wild Heritage News!

Because of these plants and the animal species of concern found in the upper watershed, Limestone Run has long been a conservation target, despite its development and extractive history. Limestone mining, damming of Dunbar Creek, and extensive logging have impacted this watershed and invasive plant species are probably the largest



Jessica McPherson

Goldie’s fern

challenge to rare plant conservation. However, pockets of large trees are found on the steep slopes and around the sandstone rock-houses suggesting old-growth, late successional forest. This year, PNHP conducted extensive surveys in this watershed funded by several different sources to document old growth forest character, inventory for rare plant and animal species, and document the threat posed by invasive plants. Previously, we have established quantitative plots for community classification, assessed the composition of interior forest birds, obtained baseline data for heavy



metals and other chemicals associated with shale gas development, and assessed the species composition and water quality of seep communities. That's a lot of focus on one area, but it can reveal even greater importance!

### Documenting Invasive Species Spread in PA's "Swamp Country"

Noah Yawn, Ecologist

This field season, I joined Seasonal Ecologist Mitch Meuser and Invasive Species Ecologist Brian Daggs in "swamp country," the glaciated region of northwestern Pennsylvania, surveying exotic invasive plant species within a variety of wetland, riparian, and woodland habitats.



Noah Yawn

Mitch Meuser and Noah Yawn after a full day of walking Lake Erie bluffs on State Game Lands 314 surveying and documenting invasive species.

Funded by the Pennsylvania Game Commission (PGC), Mitch conducted preliminary field surveys on PGC State Game Lands properties, predominantly in the northwest region but with additional scattered PGC lands in the Allegheny drainage and the Laurel Highlands areas. He surveyed 27 State Game Lands representing over 3,000 total acres, with a particular focus on PNHP Natural Heritage Areas (NHAs). The majority of these areas consisted of large wetland complexes and adjoining fens and hemlock palustrine communities, many of which contain sensitive and rare plant species, have high ecological value, and are especially vulnerable to exotic species and anthropogenic impacts. I conducted similar work funded by the Great Lakes Restoration Initiative and U.S. Fish and Wildlife Service, targeting NHAs found on private land and on Conservancy land in the northwest region, particularly within the Erie drainage and French Creek watershed.

We used iMapInvasives, an invasive species database supported by NatureServe, to document presence records for future use in informing priorities for

management. Part of our surveys included investigating areas that were previously treated for invasive species removal to determine if follow up treatment is needed. Many areas that were previously treated for multiflora rose (*Rosa multiflora*), mile-a-minute weed (*Persicaria perfoliata*), and European alder (*Alnus glutinosa*) responded very well to treatment efforts, showing little sign of regeneration.

Surveys of NHAs for invasive species certainly do not limit enthusiastic field biologists from keeping an eye out for rare species documentation opportunities. While surveying in these areas of high ecological value, we strove to visit and update any rare species records found within the NHA. Excitingly, a handful of novel rare species records will be generated through this work as a result of a number of discoveries made this summer. These discoveries include new populations of Clinton's wood fern (*Dryopteris dintoniana*), alder leaf buckthorn (*Rhamnus alnifolia*), water avens (*Geum rivale*), variegated horsetail (*Equisetum variegatum*), queen of the prairie (*Filipendula rubra*), silvery glade fern (*Homalosorus pycnocarpon*), three-petal bedstraw (*Galium trifidum*), dragon-in-the-pulpit (*Arisaema dracontium*), leatherwood (*Dirca palustris*), fringed gentian (*Gentianopsis crinita*), and cliff swallow (*Riparia riparia*).



Noah Yawn

An impressive population of fringed gentian was an exciting and unexpected find on a steep bluff above Lake Erie that was previously treated for European alder.



Noah Yawn

Variegated horsetail is known from a handful of sites along Lake Erie, where it grows on steep clay seepage areas, including this novel site found while surveying lake bluffs for invasives.



## First Breeding Confirmation of Swainson's Warbler in Pennsylvania

David Yeany II, Avian Ecologist

Nick Liadis, Avian Conservation Biologist and Executive Director of Bird Lab, and I began surveying for potential breeding occurrences of Swainson's warblers (*Limnothlypis swainsonii*) in suitable forest habitat in the Laurel Highlands during 2022. This is a bird species that has never before been documented as breeding here, despite its sporadic presence over the past 50 years. In June 2022, Liadis recorded a singing male at Bear Run Nature Reserve and alerted me right away. During summer 2022, we captured and banded a total of four male Swainson's warblers at sites in Fayette (2), Blair (1), and Indiana (1) counties. In July 2023 we collaborated to confirm the first ever breeding occurrence of Swainson's warbler in Pennsylvania at WPC's Bear Run Nature Reserve in Fayette County! Nowadays, it's a very rare occurrence to add a new breeding bird species to a state list.



David Yeany

A male Swainson's warbler belts out its emphatic song on a breeding territory at Bear Run Nature Reserve.

At Bear Run Nature Reserve, in mid-July, we observed a family group of Swainson's warblers: a male we banded in May 2023, an unbanded female, and a juvenile. Also, we banded another new male that day in a nearby territory. Unfortunately, the un-banded birds could not be photographed, due to dense vegetation, nor could they be captured at that time. Even so, we knew the importance of this discovery and the need for physical evidence.

We were determined to collect more evidence. Later in the week (July 14), we captured a juvenile (Hatch Year) Swainson's warbler and recaptured the banded male and likely father (twice!) at the same location where the family group had been observed days prior. We used target mist-netting with primarily a

combination of chip note and flight call audio playback, and captured the juvenile bird in the lowest net pocket right near the speaker location.



Nick Liadis

This mist-net is set up in the dense Rhododendron-Kalmia shrub layer at Bear Run Nature Reserve with the target of capturing nearby Swainson's warblers.

Historically, there have been about 60 total occurrences of Swainson's warbler documented in Pennsylvania since 1975. Nearly 60% of these were in the six southwest counties: Westmoreland (15), Fayette (8), Allegheny (6), Indiana (4). The first June (breeding season) observation of Swainson's warbler in Pennsylvania was made in 1975 at Bear Run Nature Reserve by Paul Wiegman, George Malosh, and others. Occasional summer observations occurred here in four other years prior to 2022 and last in 1991. Prior to last year, there had been only about 15 other Swainson's warbler observations across the state during the breeding season, however these were single birds and most were recorded for a couple of days (with the



David Yeany

This juvenile (Hatch Year) Swainson's warbler was captured in July 2023 at Bear Run Nature Reserve in Fayette County, and represents the first evidence of the species successful breeding in the state. It sports a unique color-band combination that will allow this bird to be identified if re-sighted.





David Yeany

Mature forest at Bear Run Nature reserve has the dense Rhododendron - Kalmia shrub layer that the Appalachian subspecies of Swainson's warbler prefers as breeding habitat.

exception of three consecutive years of a bird on territory in Indiana County). Now, nearly 50 years later Swainson's warbler has been confirmed as a successful breeding bird at the same WPC Nature Reserve where it has occurred most frequently over its documented history in the state.

These Swainson's warblers are presumed to be part of the Appalachian ecotype which breeds in small numbers from West Virginia southward and prefers very dense rhododendron/mountain laurel-eastern hemlock (*Rhododendron/Kalmia-Tsuga*) understories in mixed mature hardwood forest ravines. This differs from the Gulf Coast lowland ecotype that breeds in bottomland forested wetlands with cane, vines, and southern shrubs providing a similarly dense understory. Swainson's warblers are shy birds and often forage in the leaf litter of the forest floor - most often heard but not seen.



Annie Lindsay

David Yeany (PNHP-WPC) and Nick Liadis (Bird Lab) band, take body measurements, and assess the health condition of a male Swainson's warbler, as well as collect feather samples for genetic analysis.

PNHP and BirdLab are also sharing Swainson's warbler feather samples with a research group at Louisiana State University which is investigating genetic population level differences and connectivity across the breeding and wintering ranges. Having Bear Run Nature Reserve and other similar mature forests protected on state lands in the Laurel Highlands should benefit the species, as we suspect that there may be other remote locations with breeding Swainson's warbler occurrences. We are excited to continue efforts to learn more about our new population of breeding Swainson's warbler and to contribute to the conservation of this high priority species here in its most northern breeding occurrence.

### Invasive Species Hearing and Field Tour

Amy Jewitt, PA iMapInvasives Program Coordinator

Invasive species are a widespread epidemic in Pennsylvania and beyond, causing hardships that impact the state's economy, environment, and human and animal health and well-being. To raise awareness of the many negative impacts caused by invasive species, the Governor's Invasive Species Council (PGISC) in conjunction with Temple University held an informational hearing and field tour on September 8, 2023 at Temple University's Ambler Field Station.

Six Pennsylvania legislators from the House Agriculture and Rural Affairs Committee attended, including Committee chair Rep. Eddie Day Pashinski, along with many other PGISC members and stakeholders. Testimonies were provided on a variety of topics including the linkage between invasive plants and Lyme disease, invasive plant criteria, and the benefits of a proposed state-funded Partnerships for Regional Invasive Species Management (PRISM) program in Pennsylvania, among others.

The following individuals provided testimony: Jocelyn Behm (Assistant Professor of Biology, Temple University), Kathy Salisbury (Director, Ambler Arboretum), Fred Strathmeyer (Deputy Secretary for Plant Industry and Consumer Protection, Pennsylvania Department of Agriculture), Cliff Lane (McKean County Commissioner and Board Member, Pennsylvania County Commissioners Association), Matt Gabler (Executive Director, Pennsylvania Forest Products Association), and Dr. Lea Johnson (Associate Director, Land Stewardship and Ecology, Longwood Gardens).

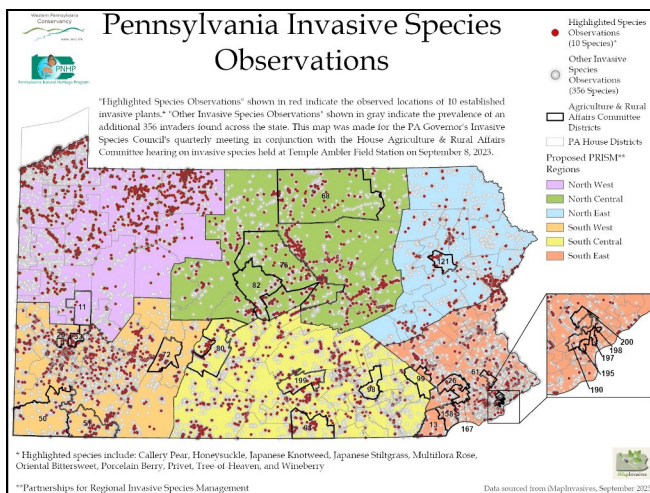
Some excerpts from testimony provided at the hearing included the following:

- "A 2021 economic impact study from the Center



for Rural Pennsylvania found that the annual impact of invasive species in Pennsylvania is over \$100 million per year.” – Testimony from Deputy Secretary Fred Strathmeyer

- “A plant is not invasive just because it is: 1) everywhere, 2) growing back no matter what you do, 3) irritating (such as a rash caused by poison ivy), 4) aggressive (such as Virginia creeper), 5) hard to get rid of (such as pokeweed), or (6) weedy (such as boxelder).” – Testimony from Kathy Salisbury
- “It is estimated that more than 50,000 acres in the Allegheny National Forest are now infested with glossy buckthorn. Mitigation requires labor-intensive cutting and spraying that often requires multiple treatments at costs of up to \$300 per acre, per treatment (i.e., \$15 million to manage one invasive species).” – Testimony from Matt Gabler



A map produced by staff of the Western Pennsylvania Conservancy and PNHP for use at the hearing helped showcase the prevalence of 10 common invasive species in Pennsylvania as well as 365 other invaders found across the commonwealth.

A recording of the committee hearing can be found here <https://www.youtube.com/watch?v=K2v048ugtGA>

### Recent Publications

Ephraim Zimmerman, Science Director

You can see the work of PNHP's scientists in peer-reviewed journals, as well as through our project reports, fact sheets about species and natural communities, lists of special-concern plants and animals in Pennsylvania, and other documents representing our work. A few recent publications showing the breadth of our interest and expertise can be found through our website: <https://www.naturalheritage.state.pa.us/>

[Publications.aspx](#). This resource is kept up to date and most of the citations contain links to the original source. You'll notice that our coauthors are wide-ranging and include partners in Pennsylvania and beyond, many include collaborators from outside Pennsylvania! That can happen a number of ways: sometimes these are publications of data from past positions, older research, or graduate studies finally making it through the publication process. A number of our staff serve as advisors to undergraduate and graduate students at colleges and universities. This often results in wonderful opportunities for publication. Finally, our biologists sometimes venture beyond the borders of Pennsylvania, often helping colleagues in adjacent Heritage programs with research. This is a fantastic benefit of being a part of the Natural Heritage Program network.

### Turtle Conservation Symposium

Kathy Gipe, Senior Non-Game Biologist/Herpetologist

A Conservation Symposium for wood, Blanding's, and spotted turtles and related Emydine turtles, was held July 10–12, 2023 at Juniata College in Huntingdon, Pennsylvania. PNHP staff and partners helped plan the symposium, attended, and presented preliminary results of research on wood turtle movement studies. This symposium built upon earlier conferences in 2016 and 2019 and was the first to focus primarily on the conservation of the turtle subfamily Emydinae (*Glyptemys*, *Clemmys*, *Emydoidea*, *Emys*, *Actinemys*, and *Terrapene* spp.). Conference presentations were held in person on July 11 and 12. A special issue of conference papers will be published in *Northeast Naturalist* in 2024. Conference presentations were organized into topical sessions that included Population Assessment and Genetics, Illegal Trade and Repatriation, Spatial Ecology, Habitat Management, and Headstarting.

