



# Pennsylvania Natural Heritage Program

information for the conservation of biodiversity

## WILD HERITAGE NEWS

Spring 2018



### Inside This Issue

<a href="#">Invasive Species - The Guests that Never Leave</a>	1
<a href="#">Unlocking the Mysteries of the Large Yellow Lady's-Slipper</a>	6
<a href="#">Notes from the Field</a>	8
<a href="#">High Conservation Value Forest Surveys</a>	8
<a href="#">Study of Rare Wetland Butterflies Completed</a>	8
<a href="#">Tidewater Mucket</a>	10
<a href="#">College Students Explore GIS Use for Vernal Pool Studies</a>	10
<a href="#">Developing Fish, Amphibian, and Reptile Data for Conservation</a>	11

**Photo Banner:**  
Presque Isle State Park interns treating invasive species at Gull Point

PNHP

## Invasive Species - The Guests that Never Leave

by  
Jeff Wagner

From the view point of PNHP, the alarm heralding the devastating impact of invasive species sounded a long time ago. However, like many organizations and programs, for years we did little more than record the presence of invasive species in our field forms as we would any species we encountered. Today, almost all of our work demands that we give attention to the impacts of invasive species on our native flora and fauna.

Over ten years ago, the Pennsylvania Invasive Species Council (PISC) formed with representatives from numerous agencies, NGOs, and private companies, including all PNHP partners, serving by appointment from the Governor. The purpose of the Council is to help coordinate work on invasive species issues in the state and to advise the Governor about those issues.

Nearly six years ago, we secured Great Lakes Restoration Initiative (GLRI) funds available through the U.S. Fish and Wildlife Service (USFWS) to take a more active role in invasive species management,

namely tracking invasive species. Thus, the Pennsylvania iMapInvasives program was begun. About the same time, GRLI funds available through the U.S. Forest Service allowed WPC to start a Cooperative Weed Management Area (CWMA) in the Lake Erie Watershed (see page 2). Now with many high biodiversity sites in its portfolio, the CWMA has grown over the intervening years. In addition to these focused efforts, we have been involved with invasive species work through numerous other projects. We have



LEW-CWMA

Weed warrior volunteers and interns are important contributors to invasive species removal projects in the Lake Erie Watershed CWMA.

accomplished a lot, have faced many challenges, and are still figuring out how to balance our core Heritage work with these other efforts. Here are some examples of what we have done over the last five years.

We have worked closely with the Bureau of State Parks (BOSP) for many years, surveying and mapping the natural communities in priority parks throughout the state. In our more recent work, BOSP requested that we document the invasive species present within their management units and assess on a simple scale the level of invasion within the units. This work provided BOSP with baseline information about individual state parks and detail about which parts of the parks would require action to control invasive species.

PNHP is particularly concerned about native species in the state that are globally under threat and have only a

few populations in Pennsylvania. One of those species, Canby's mountain lover (*Paxistima canbyi*), grows in only three places in Pennsylvania. A few years back, PNHP Botanist Steve Grund, read about a non-native scale insect (*Unaspis euonymi*) that infects members of the Celastaceae family of which *Paxistima* is a member. This alerted us to the potential for infection in Pennsylvania. Unfortunately, we did eventually discover the scale on a population of



Tara Littlefield

Canby's mountain lover infected with a non-native scale insect (*Unaspis euonymi*).

## Lake Erie Cooperative Weed Management Area

Mary Walsh



Pete Woods

Hydrilla spreads by rhizomes (horizontal, underground stems) at the bottom of ponds, lakes, and slow moving streams and sends stems to near the surface.

Hydrilla (*Hydrilla verticillata*), an aquatic invasive plant, grows very densely and outcompetes native species in ponds and lakes. Since the first known infestation in Erie County was discovered in 2015, PNHP staff members in conjunction with Pennsylvania Sea Grant have been managing the invasive plant in several ponds. This project is part of a larger effort to prioritize management of invasive species in new areas and to rehabilitate areas of high ecological significance in the Lake Erie watershed.

Partnership is the key to ensuring the long-term success of invasive species management. The WPC Heritage program participates in the Lake Erie Watershed Cooperative Weed Management Area (LEW-CWMA), a partnership that includes state and local agencies, universities, and other entities with vested interests in natural resource management. Collaboration with LEW-CWMA members, like the Pennsylvania Game Commission (PGC), Pennsylvania Department of Conservation and Natural Resources (DCNR), Mercyhurst College, Penn State Behrend and others, allows pooling of resources (volunteer time, equipment, and supplies) to ensure that high priority invasive sites are managed.

Since 2015, PNHP staff members have been identifying invasive species threats and developing plans for managing invasive species at sites on private and public properties in the watershed. The invasive species management has taken place within ten Natural Heritage Areas (NHAs), defined as habitats for Pennsylvania's rare, threatened, or endangered species or natural communities that are considered rare or exceptional in the state. With assistance from project partners, invasive species are pulled or carefully treated with herbicide in accordance with management plans to avoid damaging native plants or harming wildlife. Besides ponds infested with hydrilla, other sites where invasive species are being managed include stream banks, coastal areas of Lake Erie, wetlands, and supporting uplands in the Lake Erie watershed. Over the past three years 398 acres with invasive species have been treated on 17 properties owned by private citizens, PGC, DCNR, Penn State Behrend, Mercyhurst College, Lake Erie Region Conservancy, and others. Some sites require continued invasive management and we repeat control efforts as needed. A sustained invasive management effort is planned through 2019 and beyond to help restore natural resources in the Lake Erie watershed.

*Paxistima*. WPC and BOSP treated the populations of Canby's mountain lover on their own properties, but the one site on private property remains untreated. This is a highly ranked species and continued treatment is proposed, but without dedicated funding, it is not guaranteed.

We have talked about one of our most intensive and longer-term efforts in previous issues and other publications – the restoration of Gull Point on Presque Isle State Park. This effort involved numerous partners including the USFWS, Pennsylvania Game Commission, Pennsylvania Audubon, and Department of Conservation and Natural Resources Presque Isle State Park. Gull Point, the last known nesting and breeding site for the piping plover in the mid-1960s, had become inhospitable to the plover (and other shore nesting birds) because of extensive stands of invasive and woody plants. Over several years, the project partners along with contractors, interns, and volunteers treated dense stands of phragmites (*Phragmites australis*), narrow-leaved cattail (*Typha angustifolia*), purple loosestrife (*Lythrum salicaria*), willows (*Salix* spp.), and cottonwoods (*Populus deltoids*), opening up the sandplain communities that cover Gull Point. Last year, two pairs of plovers nested and reproduced. We received word and pictures of several of the fledglings foraging on the beaches of Florida this past winter!



Female piping plover

Vince Cavallieri, USFWS

PNHP staff continue to monitor and work with BOSP interns to maintain good habitat.

In the mid-1990s, we established plots at a number of calcareous fens around the state. Last year we were able to visit one of those sites, Millbrook Marsh in Centre County, as part of a grant funded by DCNR's C2P2 program to assist land trusts with evaluations of their properties. Our visual assessment of the wetland was confirmed when we resurveyed the old plot locations – narrow-leaved and hybrid cattail (*Typha angustifolia* and *T. x glauca*) had advanced across the marsh into the fen. Broad-leaved cattail (*Typha latifolia*) had also become more abundant. We are now working with Penn State University, Clearwater Conservancy, and Millbrook Nature Center staff to devise a plan for treatment of the cattail that is invading the fen. We hope to enlist volunteers to help with the process and plan to survey the plots again after treatment as a way to document change and success.

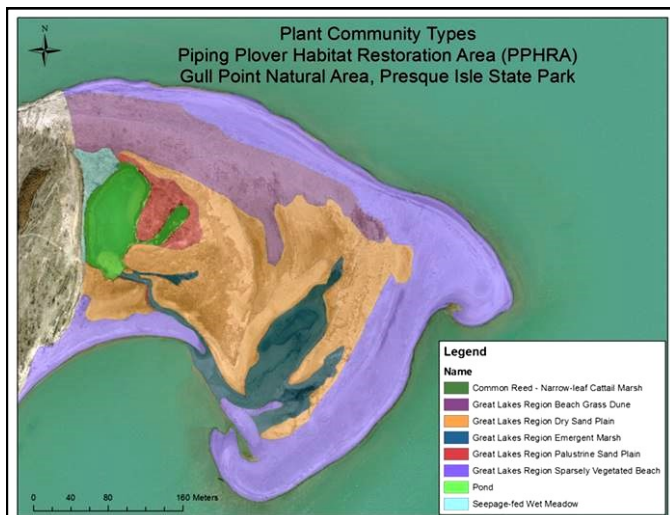
As part of the Erie County Natural Heritage Inventory update in 2012, we discovered a rare plant, dwarf scouring-rush (*Equisteum scirpoides*), within a fen owned by Mercyhurst University. This was the first record for this species in the state. Of course the fen, as typical of these unique



Dwarf scouring-rush

Pete Woods

wetlands, supports numerous other rare plants. It is a postage stamp size community surrounded by young forest and fields with lots of invasive plants. The wetland is remarkably intact but we noted that some invasive species were either encroaching upon or actually in the fen. Given the sensitivity of the habitat and the relatively small amount of invasion, WPC staff under the guidance of a certified herbicide applicator had treated the invasives in the fen and surrounding area. Under the Lake Erie Watershed CWMA, we will continue to maintain this unique site.





JoAnn Albert

Betsy Leppo uses a weed wrench to remove invasive shrubs.

PNHP has been working with vernal pools for many years – researching, surveying, classifying, and mapping them. In recent times, we have been working with landowners to help them better manage and protect their pools. In addition, we have been working with BSP to restore pools in locations that likely supported pools but due to

disturbance, have been lost. In our restoration project at Gifford Pinchot State Park, we not only needed to restore the hydrology of the site (with help from a consultant) but also had to remove a substantial amount of invasive species including honeysuckles (*Lonicera* sp.), autumn olive (*Elaeagnus umbellata*), oriental bittersweet (*Celastrus orbiculatus*), multiflora rose (*Rosa multiflora*), and others. Between WPC, state park staff, and numerous volunteers, we battled through the thickets of invasive shrubs and completed the restoration of several vernal pools on site.



JoAnn Albert

Gifford Pinchot State Park vernal pool site pre (left) and post (right) invasive species removal.

Beyond the confines of our various projects, PNHP staff are passionate about seeing the special places, species, and natural communities that we spend our time documenting survive. Trying to find the time and the

### Early Detection Matters

Amy Jewitt

Andrew Rohrbaugh, a botanist with the Pennsylvania Department of Conservation and Natural Resources' Bureau of Forestry, spends most of his time outdoors looking at plants, both native and invasive. In the fall of 2017, he observed an infestation of an invasive swallowwort, probably black swallowwort (*Vincetoxicum nigrum*), while hiking the Tuscarora Trail in southeastern Pennsylvania and documented his findings in Pennsylvania iMapInvasives.



Andrew Rohrbaugh

Swallowwort along Tuscarora Trail

Although other invasive plant species were present in the area, this finding was important because swallowworts are highly invasive and relatively uncommon throughout most of Pennsylvania, making them a high priority species for treatment. Of greatest concern with this species is the possibility that seeds from the swallowwort, high atop Blue Mountain, would be carried by wind across the entire Cumberland Valley. If allowed to spread, areas previously untouched by this invasive species could become infested, leading to ecological problems including competition with native species and reduced food and habitat for wildlife.

By knowing the exact location and extent of invasive plant populations (especially those that fall under the category of Early Detection & Rapid Response), natural resource professionals can prioritize future treatment efforts in areas that need it most. In this regard, the iMapInvasives program is a useful tool that can capture location and abundance data entered by one person and make it available to other individuals and organizations that have the resources to take action.



John Kunsman

Eared false-foxglove (*Agalinis auriculata*)

resources to provide the needed stewardship to any site is difficult. One of our staff, Botanist John Kunsman, has spent his own time for many years stewarding several important sites. He has been visiting one site in eastern Pennsylvania for over 20 years, hand pulling weeds and trying to favor the rare, annual plant, eared false-foxglove (*Agalinis auriculata*). As an annual, some years yield many plants and others fewer but due to John's efforts this plant population has fared well over the years.



Rocky Gleason

John Kunsman at the eared false-foxglove site removing a clump of Chinese silvergrass, which can spread to form large monocultures.

Whether we like it or not, we have to pay attention to invasive species in all aspects of our work. Just in the last week, the Bureau of Forestry (BOF) was alerted to an invasive swallowwort, which stands to affect a ridgeline in central Pennsylvania (see page 4). The BOF along with other agencies and organizations in the state can only spend limited time without dedicated funding to deal with invasives. PNHP does not have the capacity or charge to take on active stewardship to any extent, but we are positioned to offer our expertise in tracking,

identifying, and controlling these species. Recent progress by DCNR in beginning a Plant Conservation Alliance (PCA) for Pennsylvania, following on the models from a number of other states, is a very positive development. The PCA will solicit the help of many groups and organizations across the state to maintain sites with the highest priority plant species. Through this program, PNHP will be able to guide and advise stewardship work, which will definitely include the control of invasives species. The goal of any work we do through the PCA or other efforts to reduce threats like invasive species is to see that our native species, particularly those that are rare, are not lost.

### About the Author

Jeff Wagner directs the Natural Heritage Program at WPC and works with the PNHP partners to administer and manage the overall program for the state. Jeff previously served as a Community Ecologist and County Natural Heritage Coordinator for the program. He is delighted to work with an expert staff of curious, experienced, and all around great people.



## Unlocking the Mysteries of the Large Yellow Lady's-Slipper

by

Mary Ann Furedi



Charlie Eichelberger

Large yellow lady's-slipper (*Cypripedium parviflorum* var. *pubescens*)

*pubescens*). This plant is a bright yellow orchid found in a variety of habitats ranging from the damp forest understory of mixed deciduous and coniferous forests to open meadows and along streams in calcareous soils. The large yellow lady's-slipper is one of several lady's-slipper orchids found in Pennsylvania. These orchids are aptly named after the shape of their lowest petal which resembles an inflated pouch or slipper. Other orchids in this group in Pennsylvania include the pink lady's-slipper (*Cypripedium acaule*), showy lady's-slipper (*Cypripedium reginae*), and the small yellow lady's-slipper (*Cypripedium parviflorum* var. *parviflorum*).

The large yellow lady's-slipper is the widest ranging *Cypripedium* species in North America. It is known from the United States in 42 of the lower 48 states plus Alaska, as well as from most of Canada. Although its range is extensive, only a few documented populations are large enough to be considered secure for the foreseeable future. Most populations are small and infrequent across the landscape. There is little quantitative data about population persistence over time, but the anecdotal evidence that does exist suggests that populations are declining range wide.

Collection pressure is likely a contributing factor to the decline of this species. Like many of its orchid relatives, the large yellow lady's-slipper has been sought after and collected for its aesthetic beauty and its supposed

With a new year comes the opportunity to expand our understanding of yet another interesting plant found in Pennsylvania. With a new grant from the Wild Resource Conservation Program, PNHP staff began working on a new project focused on the large yellow lady's-slipper (*Cypripedium parviflorum* var.

medicinal values. Plants are collected from the wild and transplanted into orchid enthusiasts' gardens or sold to the nursery trade to attempt propagation. Native Americans and herbalists collected the root and made a tea to treat ailments such as anxiety, insomnia, and depression. Because of this collection pressure, many orchids, including species of the genus *Cypripedium*, are included under Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Other likely factors contributing to the decline of large yellow lady's-slipper are habitat degradation and loss, browsing by white-tailed deer (*Odocoileus virginianus*), and competition from invasive plants.

The trend in large yellow lady's-slipper decline is likely occurring in Pennsylvania as well. The orchid is currently listed as PA Vulnerable which means there is already an assumption that populations are in danger of decline because of collection pressure. However, little effort has been focused on understanding the health of and quantifying possible threats to this species in Pennsylvania. This lack of knowledge about the orchid and the condition of existing populations makes it difficult to develop well-informed management plans that address the actual conservation needs of the species.

The focus of this new project is to begin to fill the gaps in our knowledge of large yellow lady's-slipper in Pennsylvania. Since the project began, PNHP has collected information on approximately 25 populations of the orchid. Many of these records are observations from only one visit and are greater than 10 years old. They do not provide much information about population dynamics



Rachel Goad

An example of the rich forests where this species is typically found.



Rachel Goad

and the ecology of the species. A single visit to a population is like taking a photograph. It provides you with information about that moment in time but it doesn't necessarily provide you with details about the past and future performance of a population. This spring, we will be implementing a monitoring effort that will provide us with more meaningful population level data, help to characterize the habitat needs of the species, and provide more insight into potential threats.

In addition to documenting threats to large yellow lady's-slipper during our site visits, we will further explore potential threats to the species by tapping into the knowledge of the many botanists, naturalists, and others who have on-the-ground knowledge of this orchid in Pennsylvania. We have developed a survey that focuses on capturing information about populations they are familiar with and any evidence of harvest or other observed threats. This information will help us further quantify the threats that natural populations face.

The overall goal of this project is to combine knowledge of the ecology of the species with a greater understanding of population dynamics and threats to develop management strategies for the protection and conservation of this species. We also hope to demonstrate that the methods used to increase our understanding of this species can be applied to other vulnerable and rare species in Pennsylvania.

### **A few facts about lady's-slipper orchids**

- There are about 50 species widespread throughout regions of Europe, Asia, and North America. Twelve lady's-slipper orchids are found in the United States.
- The genus name of this orchid group, *Cypripedium*, is derived from the Greek words "Cypris" an early reference to the Greek goddess of love, Aphrodite, and "pedilon" for sandal.
- Insects are required for pollination and must enter the 'front door' of the slipper-like lower petal, proceed through a maze, and exit through the 'back door' of the petal to successfully pollinate an orchid.
- Orchid seeds are some of the smallest seeds of any vascular plant. A single capsule could contain 7,000 seeds!
- These orchids require a fungal friend (mycorrhizal fungi) during their life cycle. They depend upon mycorrhizal relationships for seed development, seedling establishment, and possibly for adult phases such as dormancy. The requirement for this mycorrhizal relationship is the reason why wild collected plants usually decline and die when transplanted into gardens.

We thank DCNR's Wild Resource Conservation Program (WRCP) for the support of this project. If you are interested in learning more about this project or know the location of a large yellow lady's-slipper population that you would like to share, please feel contact Mary Ann Furedi ([mfuredi@paconserve.org](mailto:mfuredi@paconserve.org)).

### **About the Author**

Mary Ann has worked with the Pennsylvania Natural Heritage Program for 10 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 different natural systems in Pennsylvania and understanding how these systems change over time.



## Notes from the Field

### High Conservation Value Forest Surveys

Charlie Eichelberger and Betsy Leppo

PNHP was approached by the Bureau of Forestry to conduct surveys on several tracts of High Conservation Value Forest (HCVF), a designation that the Bureau uses in part to satisfy requirements of their Forest Stewardship Council (FSC) certification. The HCVF boundaries were established using a number of different criteria which highlight areas to be set aside for biodiversity conservation.

While there are dozens of HCVF tracts across the state forest system, a few areas were prioritized for rare species inventory during the 2018 field season. The Crystal Lake tract of Pinchot State Forest, just south of Wilkes Barre, rose to the top of the list. This area is a unique spot in the state, containing thousands of acres of scrub oak and low heath barrens butted against high-elevation, windswept, rocky summits at over 2,000 feet. This unique harsh habitat provides a refugium for plant species that favor colder climates, including the state-endangered three-toothed cinquefoil (*Sibbaldia tridentata* = *Potentilla tridentata*, G5 S1).



Rocky Gleason

The diminutive three-toothed cinquefoil is an evergreen perennial, which grows only at a handful of places in Pennsylvania, including the high peaks around Crystal Lake.

The Crystal Lake tract's expansive heath barrens also provide the right habitat for over a dozen moth and butterfly species of concern. Daytime surveys for butterflies and nighttime bait and light stations for moths will collect information on species such as the state endemic flypoison borer moth (an unnamed species of *Papaipema*).



Betsy Leppo

The caterpillars of the fly poison borer moth feed inside the bulbs of the fly poison plant. This plant is poisonous to most other kinds of insects and mammals.



Betsy Leppo

Fly poison borer moth

As part of this inventory effort, we will also survey for bats, herptiles, and natural communities. Access to the Crystal Lake tract is a challenge, so we have utilized aerial imagery interpretation to help guide us to small patches of unique habitats that are surrounded by nearly impenetrable thickets of scrub oak. We hope our efforts will shed more light on the importance of this HCVF to the conservation of the species known from Crystal Lake, and those yet to be discovered!

### Study of Rare Wetland Butterflies Completed

Betsy Leppo

Pennsylvania recently completed a collaborative project funded by a Northeast Regional Conservation Need (RCN) grant. Our work focused on fourteen butterfly

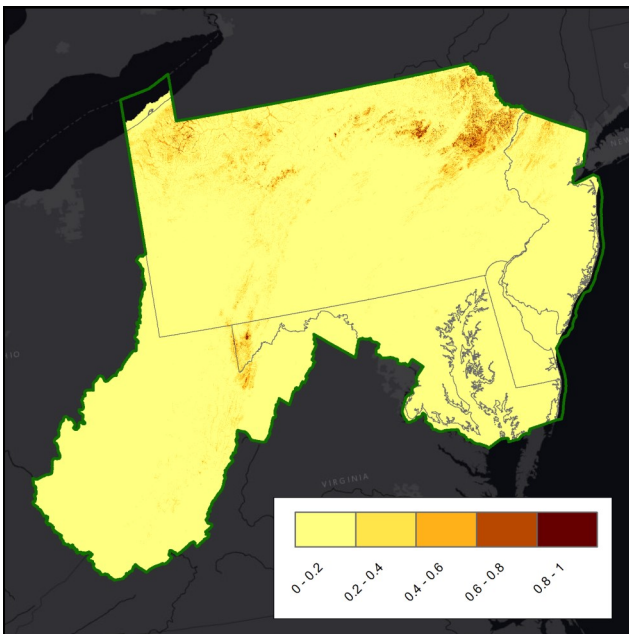


Betsy Leppo

Bog copper (*Lycaena epixanthe*)

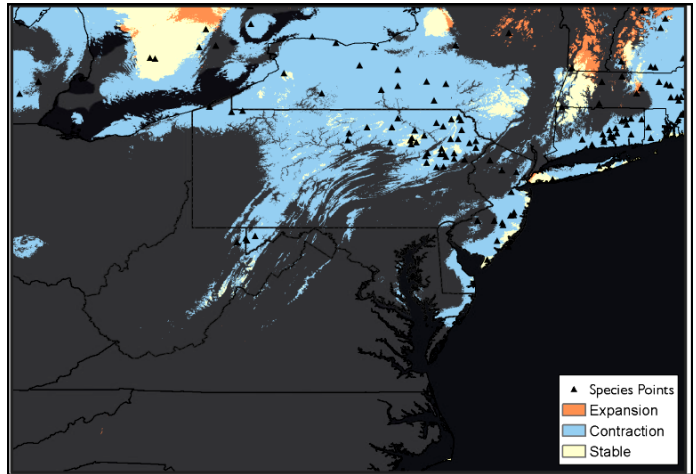
Species of Greatest Conservation Need (SGCN) that live in wetland habitats. We worked with four other states in the region: Delaware, Maryland, New Jersey, and West Virginia.

In 2016 and 2017, we conducted field surveys to look for new populations and check on older known sites. We evaluated the current condition of their habitats and sought to better understand how these species are doing in the region. PNHP staff conducted surveys at 47 wetland sites across the state and documented populations of wetland butterflies at 35 new sites. We also gathered 21 new locations from project collaborators in Pennsylvania.



Bog copper (*Lycaena epixanthe*) species distribution model. Deeper shades of red indicate a higher chance of the species being present.

All confirmed populations in Pennsylvania and across the region from partner states were mapped in ArcGIS and used to model each species distribution in terms of both habitat and climatic conditions. Data collected prior to 2016 was also evaluated and included in the models. From the models, we were able to project the likely expansion, contraction, and/or stability of populations of each species within the participating states. The results are presented in the report for each species and several examples are explored in greater depth.



Bog copper (*Lycaena epixanthe*) future climate suitability model. The blue color indicates areas where the climate may not be suitable for the bog copper in 50 years. Orange indicates new areas where the species may expand to and tan is stable.

A final goal of the project was to initiate habitat enhancement projects at a number of sites in Maryland and Pennsylvania. Maryland identified eight sites and worked with partners to plan and/or initiate management activities while Pennsylvania did so for 15 sites. The results of these projects are discussed in the reports, and best management practices (BMPs) for site selection and management are provided.

Report citation: Selfridge, J., B. Leppo, S. Olcott, R. Somes, C. Tracey, and P. Woods. 2018. Conservation and Management of Rare Wetland Butterflies: Strategies for Monitoring, Modeling and Wetland Enhancement in the Mid-Atlantic Region. Final report for Regional Conservation Needs Grant 2015-02 to the Wildlife Management Institute.

For more information on this project, please contact Betsy Leppo in Harrisburg at [bleppo@paconserve.org](mailto:bleppo@paconserve.org) or Chris Tracey in Pittsburgh at [ctracey@paconserve.org](mailto:ctracey@paconserve.org).

## Tidewater Mucket

Mary Walsh

The only free-flowing river that connects to a coastal estuary in Pennsylvania, the Delaware River is home to a diversity of aquatic organisms that are linked to coastal habitats. The tidewater mucket (*Lepotodea ochracea*) only occurs in rivers with a coastal connection in its range from Georgia to Nova Scotia. The species was once thought to be extirpated from the Delaware River, but recent findings suggest it persists in the river.



Mary Walsh

Tidewater mucket

Through collaboration with the Partnership for the Delaware Estuary, the Pennsylvania Natural Heritage Program will conduct a study to clarify habitat requirements and understand the extent of tidewater mucket range in the Delaware River watershed. The species is declining across its range. The state conservation ranks indicate that the species is Critically Imperiled or Imperiled in 11 of 15 states and provinces in which it occurs. According to a 2012 global assessment, the IUCN Redlist, the range of tidewater mucket is estimated to have declined 20-25% in the last 30 years. In Pennsylvania, the species is believed to have a relatively limited distribution in the Delaware River and the habitat requirements are not known.



Mary Walsh

Delaware River at Neshaminy State Park

Over the course of the project the species distribution, abundance, and habitat associations within the lower Delaware River and Pennsylvania tributaries will be assessed. An outcome of the project will be to provide an assessment of the conservation status of the tidewater mucket with recommendations for species management. Informed species management will be a necessary part of a strategy to prevent further range declines. Information from our assessment will be applicable to management of the species in other parts of the tidewater mucket range.

## College Students Explore GIS Use for Vernal Pool Studies

Ryan Miller

Zoologists Ryan Miller and JoAnn Albert met with students from Allegheny College to explore vernal pool ecology and conservation. The conservation biology and geographic information systems (GIS) class met PNHP zoologists at Maurice K. Goddard State Park where they observed four vernal pools and collected data. The students used a water quality meter and GPS unit, and observed amphibian egg masses and fairy shrimp.



Chris Shaffner, Allegheny College

Vernal pool sampling with Allegheny College students.

After the field visit, the class took the data back to the GIS lab at Allegheny College for analysis. Students learned about GIS tools that helped them visualize the distances that species like spotted salamanders travel to use the pools to breed. They were also able to use mapping software to look for impacts to pools like road salt runoff that was causing abnormally high readings on their water quality meter. Maurice K. Goddard State Park is one of ten parks where PNHP staff and Clarion University are currently surveying vernal pool habitats. PNHP staff explained how vernal pool data from the study would be used to map pool locations and provide management recommendations to the park for future protection of the pools.

## Developing Fish, Amphibian, and Reptile Data for Conservation Use

Kierstin Carlson

The Heritage Information Management team received a State Wildlife Grant (SWG) from the U.S. Fish and Wildlife Service and the Pennsylvania Fish and Boat Commission (PFBC) for a geodatabase project, which ran from September 2015 through December 2017. The goal was to organize, process, and convert Species of Greatest Conservation Need (SGCN) information into the Pennsylvania Natural Heritage Program (PNHP) Biotics database format and develop Conservation Planning Polygons (CPP) needed for Pennsylvania Natural Diversity Inventory (PNDI) environmental review.

The data for amphibians and reptiles comes from the Pennsylvania Amphibian and Reptile Survey (PARS), a joint venture between the PFBC and the Mid-Atlantic Center for Herpetology and Conservation (MACHAC). It is an online database (<https://paherpsurvey.org>) with a team of members from skilled professionals to amateur naturalists or “citizen scientists” who like to look for reptiles and amphibians and enter their finds into the database. So far, nearly 10,000 field observations (verified for correct species identification by PARS reviewers) and historical museum specimens for Species of Greatest Conservation Need have been submitted to Heritage Information Management for processing.

The data for the fish comes from the work that culminated in the *Fishes of Pennsylvania*, published in 2016 and written by Jay R. Stauffer, Douglas P. Fischer, and Robert W. Criswell. In this book, there are over



Pete Woods

Northern leopard frog

35,000 records for SGCN. We have focused first on processing state-listed species.

A total of 4,663 amphibian and reptile records of 39 species from PARS and 882 records from the *Fishes of Pennsylvania* were entered in the Heritage system. Species that had no records in the Heritage database prior to this project include Cope's grey treefrog, Atlantic coastal leopard frog, western chorus frog, lake sturgeon, hickory shad, bigmouth buffalo, and river shiner.

This project has boosted the knowledge of fish, amphibian, and reptile Species of Greatest Conservation Need in Pennsylvania, enabling more effective conservation planning and accurate environmental review of projects. There are thousands of fish records that we are still processing, and PFBC is sending us new PARS records as the database continues to grow. We plan to continue processing records and are looking to additional SWG funding to support the effort.

### Species with increases of 1000% or greater in the number of records in the Heritage database

Scientific name	Common name	Records prior to 9/15/2015	Records added during grant through 12/31/2017	Total records	Percent increase
<i>Ambystoma opacum</i>	Marbled Salamander	6	167	173	2783%
<i>Notropis bifrenatus</i>	Bridle Shiner	3	66	69	2200%
<i>Anaxyrus fowleri</i>	Fowler's Toad	14	247	261	1764%
<i>Notropis buechanani</i>	Ghost Shiner	1	17	18	1700%
<i>Lithobates pipiens</i>	Northern Leopard Frog	11	174	185	1582%
<i>Ambystoma jeffersonianum</i>	Jefferson Salamander	6	72	78	1200%
<i>Umbra pygmaea</i>	Eastern Mudminnow	7	76	83	1086%
<i>Lepisosteus oculatus</i>	Spotted Gar	2	20	22	1000%