

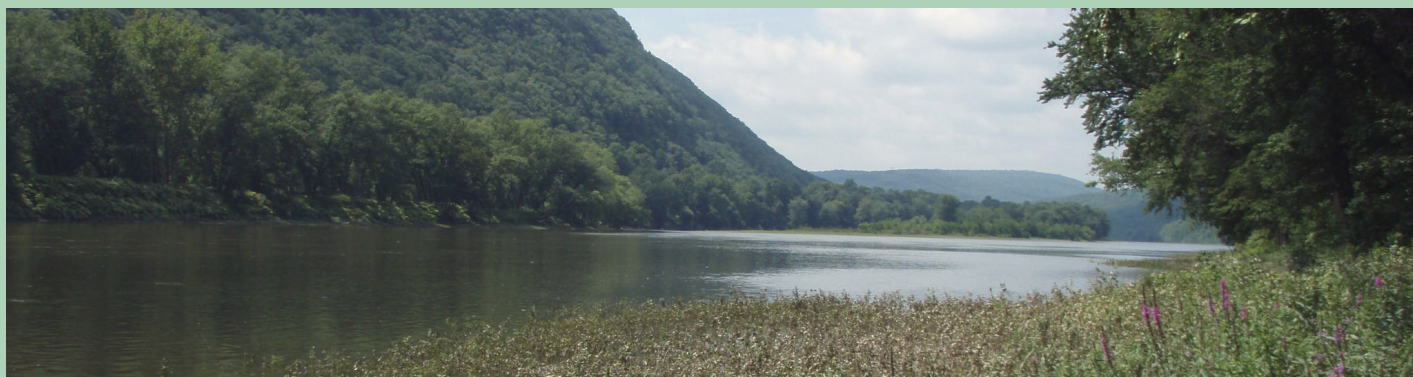


Pennsylvania Natural Heritage Program

information for the conservation of biodiversity

Wild Heritage News

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Photo Banner:
Mary Walsh

A view of the Susquehanna River; home to a diverse community of freshwater mussels.

In Search of Freshwater Mussels

by
Mary Walsh

Burrowing in the sand and rock bottoms of rivers and lakes, freshwater mussels often go unnoticed by boaters and fishermen. Although they receive little public recognition for their efforts, the shelled critters quietly spend their lives consuming particles from our waters, making them clearer and cleaner. One species, the eastern elliptio, is estimated by Dr. Danielle Kreeger at the Partnership for the Delaware Estuary to filter 9.8 billion liters of water per hour in the Delaware River. Freshwater mussels in the Susquehanna River reduce the fine particles and nutrients in the waters flowing into the Chesapeake Bay, adding to efforts by environmental groups, landowners, and agencies to clean up the Bay and its tributaries.

The sedentary habit and unique life cycle of mussels causes them to be vulnerable to habitat disturbance which may result in population decline. The mussel larvae are parasitic, clinging to fish gills and fins. Over a period of weeks fish can transport the larva of native mussels a distance from their origin before the mussel falls off and begins life as a juvenile. Many mussels use

only a few species of fish or even a single species of fish as a host. Where fish hosts are absent, mussel larvae don't survive and no new generations are created. While adult mussels can move short distances, the ability to relocate to a more hospitable environment during a pollution or extreme environmental occurrence (e.g., a drought) is limited. As a result pollution events or localized habitat destruction can be arguably worse for mussels than for mobile species. Declines in populations of rare and common mussels are cause for concern among natural resource managers.



A yellow lampmussel filters plankton and particles from river water. The food sticks to the lining of its gills, and hair-like cilia sweep food into its mouth.

Mary Walsh



Mary Walsh

The sun warms the wide shallow reaches of the Susquehanna River.

Biologists in the Pennsylvania Natural Heritage Program have been studying the bivalves in the Susquehanna River watershed for six years. Studies of their distribution, habitat, and population genetics in the Pennsylvania portion of the watershed were the focus of a State Wildlife Grant administered by the Pennsylvania Fish and Boat Commission, and a Wild Resource Conservation Program Grant administered by the Pennsylvania Department of Conservation and Natural Resources.

PNHP staff surveyed the diverse waterways of the Susquehanna River watershed, including the bottoms of small, cool groundwater-fed streams and warm, meandering creeks, as well as the wide Susquehanna River to identify mussel habitats. In another dimension of the project, models of watershed and landscape characteristics of mussel occurrences may help identify features associated with mussel species and rich communities. Variables associated with mussel occurrences are analyzed in Maximum Entropy models. Maps of potential habitats can be used to identify survey locations.



Mary Walsh

Snorkelers search stream bottom habitats for mussels.

From 2008 to 2012 biologists, donning protective wetsuits and snorkels, counted rare and common freshwater mussels nestled among the rocks. Standardized search techniques were used to estimate the numbers of mussels present; future survey efforts

can be compared to the information collected in this project and analyzed for changes in communities and populations. Of the 7,000 mussels found in 154 timed-search surveys, the most common species in the watershed, the eastern elliptio, dominated the catch. Some waterways, like Buffalo Creek and West Branch Susquehanna River in Union County, Aughwick Creek in Huntingdon County, Juniata River in Mifflin County, and Middle Creek and Penns Creek in Snyder County, had the highest numbers of eastern elliptios in the watershed. The Susquehanna River, however, does not support as many eastern elliptios as its counterpart to the east, the Delaware River. One proposed hypothesis for the low number of eastern elliptio in the river is that their primary host fish, the American eel, has been greatly reduced in the Susquehanna River due to their inability to migrate past the large hydropower dams on the lower reaches of the river.

Of the eighteen species of mussels reported from the watershed historically and in recent surveys, eleven species were found in surveys by Pennsylvania Natural Heritage Program biologists. Information about the distribution and population characteristics of species of concern can be used for management decisions.



Mary Walsh

PNHP aquatic ecologist, Beth Meyer, sorts species of mussels collected during a survey.

One of the rarest Susquehanna mussels, the brook floater, occurred in only three waterways in the Pennsylvania portion of the Susquehanna River watershed. The relatively more common yellow lampmussel is found throughout the watershed, but its populations are declining throughout much of its range, which extends along Atlantic coastal rivers from Georgia to Nova Scotia. While it is considered critically imperiled or imperiled in eight states or provinces, and extirpated or possibly extirpated from four additional states, the yellow lampmussel was named a responsibility species in the Pennsylvania State Wildlife Action Plan because of its significant populations in Pennsylvania.



Mary Walsh

The brook floater has few occurrences in the Susquehanna River watershed. Its range appears to be shrinking in Pennsylvania and other habitats in rivers flowing to the Atlantic coast.

Another component of the project utilized genetic analysis to assess the viability of populations for mussel species and to potentially identify genetically unique populations that should be considered for conservation effort. Project partner, Dr. Curt Elderkin from The College of New Jersey, collected samples of mussels and analyzed the genetic relatedness among populations of the eastern elliptio and yellow lampmussel across the watershed. By gently prying open mussels and clipping a small piece of mantle tissue before placing the mussels back in the river bottom, the populations across the watershed can be determined to be relatively isolated or genetically similar. Results indicate that the eastern elliptio has high genetic diversity and genetically distinct populations in the Susquehanna River watershed; a population of interest that seems genetically isolated occurs in a Juniata River tributary. The yellow lampmussel populations do not appear to be distinct genetically and have low genetic diversity. Small populations of yellow lampmussel have an increased risk



Mary Walsh

Mussels are gently pried open to collect a small sample of mantle tissue for genetic analysis. Mussels are returned to the stream bottom after tissue collection.

of extinction because of low genetic diversity; for this reason large populations in different parts of the Susquehanna watershed should be preserved.

The future of mussels in the Susquehanna River watershed is uncertain. Zebra mussels, legacy mining pollution, urban and agricultural runoff, absence of fish



Mary Walsh

Urbanization on Fishing Creek

hosts, and habitat destruction persist in the watershed. The water quality in the Susquehanna River is under further evaluation by the Pennsylvania Fish and Boat Commission and the Pennsylvania Department of Environmental Protection.

Results of the mussel studies in the Susquehanna River watershed can be added to the working body of knowledge about its natural resources. Conservation measures for streams with dense mussels, rare species, or populations of interest should be employed for the long term viability of mussel habitat.



Beth Meyer

Susquehanna River at Vinegar Ferry

Survey of Aquatic Vegetation of the Delaware River

by
Mary Ann Furedi

Have you ever been swimming in a lake or river and noticed plants growing under the water? These aquatic plants, also known as submerged aquatic vegetation or SAV, are characteristic of most aquatic systems and provide many positive ecological functions. Aquatic vegetation is the primary producer that drives the riverine food chain. As aquatic plants photosynthesize, the sugars and starches produced are used to build plant tissues which, in turn, are consumed by stream invertebrates, fish, and other herbivores. Aquatic plants also supply the watery environment with oxygen, a by-product of photosynthesis. Decaying plant tissues release necessary minerals into the aquatic environment and provide additional food sources for detritus feeders. Patches of SAV, called beds, create microhabitat for stream invertebrates, provide critical feeding and cover habitat for fish, and help to slow flowing waters, filter and stabilize sediment, reduce turbidity, and remove nutrients from the water column. Some species of concern in Pennsylvania, including the dwarf wedge mussel (*Alasmidonta heterodon*), brook trout (*Salvelinus fontinalis*), and bridled shiner (*Notropis bifrenatus*), utilize SAV beds during stages of their lifecycle.



Mary Ann Furedi

A mixed bed of submerged aquatic vegetation (SAV)

Changes to SAV beds may negatively alter the aquatic environment. Shifts in bed composition from native plants to aggressive, non-native species can alter the microenvironment for aquatic organisms. For example, non-native invasive aquatic plants, such as Eurasian water-milfoil (*Myriophyllum spicatum*) and hydrilla (*Hydrilla verticillata*), form dense beds that can reduce light availability in the water column thus contributing to the decline of native plant species. These dense beds



Mary Ann Furedi

A view of the upper Delaware River in Pennsylvania

may also interfere with the recreational use of an area by affecting boating or swimming. Changes in SAV species composition may affect the aquatic food chain resulting in an imbalance.

A proliferation of SAV may be an indicator of changes in water quality. Blooms of aquatic vegetation and algae are often linked to nutrient pollution, and the subsequent fluctuations in dissolved oxygen and pH levels due to plant respiration can severely stress fish and other aquatic organisms. On the other hand, fragmentation or loss of SAV beds, either through anthropogenic disturbance or natural ones like high water events, may dramatically reduce habitat availability for other aquatic organisms. Additionally, SAV bed reduction and loss can negatively affect water quality and substrate stability.

Understanding the dynamic nature of SAV beds is one tool used by resource managers to gauge the health of aquatic systems and guide management activities. A periodic inventory and mapping of SAV beds can provide critical information on changes occurring in a river or lake. The Pennsylvania Natural Heritage Program (PNHP), in conjunction with U.S. Geological Survey (USGS) partners, is currently working on a project to help National Park Service resource managers in the Upper Delaware Scenic and Recreational River (UPDE) and the Delaware Water Gap National Recreation Area (DEWA) to better understand the composition and distribution of SAV in the Delaware River. John Kunsman (PNHP botanist)

completed an impressive survey of 196 SAV beds in 1991 and 1992, but no recent efforts have been made to revisit the documented beds to examine changes in species composition and persistence. Since Kunsman's survey, the Delaware River has experienced multiple large-scale flood events that may have altered the size and distribution of SAV beds. Additional changes have occurred within the river and surrounding watershed, such as land development and new invasive species introductions, which may have altered water quality and SAV beds.

The current survey effort combines the ground-truthing methods used in Kunsman's survey with some newer technology to document and map the distribution and composition of SAV beds in the UPDE and DEWA, about a 112 mile stretch of the Delaware River. Beginning in August 2012, when river water depth is typically shallow, selected SAV beds from Kunsman's survey were visited to document bed persistence, define boundaries, and document species composition and other environmental metrics. Within each bed, multiple, one-meter plots were established and their locations documented using sub-meter GPS units.

Within each plot, we recorded estimates of species composition and cover along with additional environmental variables such as water depth, velocity, and substrate composition. A field spectrometer was used to collect field reference spectra for the plant species commonly occurring in beds. Since plants have distinct spectral signatures, it may be possible to apply these signatures to remote sensing technology to identify the dominant plants species in SAV beds. For overall mapping purposes plus other applications, bathymetric data of the beds and surrounding river channel were also recorded using side scanning sonar. Corresponding to the timing of the ground survey efforts, the U.S. Air Force Auxiliary, Civil Air Patrol flew the stretch of the river to collect aerial imagery



Searching for scattered remnants of an SAV bed.

Mary Ann Furedi



PNHP staff preparing to sample an SAV bed.

Jennifer Krstolic (USGS)

(hyperspectral and LiDAR) that will be used to map the extent of SAV beds and possibly help with species identification.

We sampled a total of 63 SAV beds in 2012 and 2013. Further data analyses will be done but general patterns indicate that many of the SAV beds identified in 1991 and 1992 still persist although beds may differ in size. Several new beds were identified but further analyses of the aerial imagery are needed to determine if these are actually new beds or shifting/fragmentation of previously existing beds. Beds range in density from scattered patches of plants to extensive beds. General vegetation patterns appear to be similar to the 1991-1992 surveys. Overall, waterweed (*Elodea* sp.) and riverweed (*Podostemum ceratophyllum*)



A rock covered with riverweed.

Mary Ann Furedi

were the most common species throughout the stretch of the river sampled. Some plants, such as water-celery (*Vallisneria americana*) and water-stargrass (*Heteranthera dubia*) are found throughout DEWA but appear to be limited to the lower reaches of UPDE. Further analyses will allow us to identify and define plant communities associated with this stretch of the Delaware River.

Our USGS partners are beginning to explore the application of bathymetric data, hyperspectral imagery, and LiDAR in mapping the SAV beds. This is a relatively new application of the use of this data for mapping riverine habitats so it will be exciting to see the outcomes of our effort. Nevertheless, data from this effort will provide a baseline for National Park Service staff to use for future monitoring efforts of this valuable resource.

Notes from the Field

Bat Box Installation

Funding from the Huplits Fund of the Sierra Club enabled PNHP

zoologists, WPC stewardship staff, and dedicated volunteers to place seven large bat boxes on conserved lands across western Pennsylvania. These roost structures provide ideal roosting habitat for up to four species of bats, primarily the little brown bat (*Myotis lucifugus*) and big brown bat (*Eptesicus fuscus*).

The boxes can accommodate more than 200 bats, and will

hopefully house maternity colonies where females birth and raise their pups until the pups are ready to forage on their own. Bats are long-lived animals, sometimes living for decades in the wild, and raise only one or two pups a year. Unfortunately, since the arrival of the fungal disease known as white-nose syndrome (WNS) to Pennsylvania in 2008, the populations of several bat species have been decimated, including those that were once very common. Affecting bats as they hibernate in caves and mines, WNS has spread across the region, and many biologists are concerned about the future of those species most affected by WNS.

The good news is that despite the population crash, limited survivors resilient to the disease remain. The hope is that their offspring are also resilient, and efforts to boost recruitment of resilient young into the breeding population are underway where concentrations of these resilient bats still exist. Bat boxes are one way to provide roosting habitat for maternity colonies and hopefully give these important colonies a boost. With the decline having occurred so rapidly, biologists are still struggling to adequately inventory where the most robust populations of survivors still exist. The new bat boxes are also part of a regional monitoring network known as the



Installers pause after putting the finishing touches on a newly placed bat box at a portion of WPC's Wolf Creek Narrows Natural Area in Butler County.

Charlie Eichelberger

Appalachian Bat Count (more information can be found at <http://www.pgc.state.pa.us>), allowing biologists and volunteers to help chart the health of our remaining bat populations.

PA Botany Symposium: A Blooming Good Time

The 2014 Pennsylvania Botany Symposium was held in State College, Pennsylvania on November 7 and 8 at the Penn Stater Hotel and Conference Center. This event was the culmination of two years of planning by the steering committee comprised of people representing the Western Pennsylvania Conservancy (WPC), the Carnegie Museum of Natural History (CMNH), Penn State University, the Morris Arboretum at the University of Pennsylvania, the Pennsylvania Department of Conservation and Natural Resources (DCNR), and Civil and Environmental Consultants (CEC). The steering committee contracted Lisa Smith, a private consultant, and Karen Sandorf of Graphic Design/Illustration to function as conference coordinator and webmaster. We were able to expand this year's symposium with the generous support from our sponsors. Their contributions made the 2014 PA Botany Symposium a huge success.



Lisa Smith

The primary function of the Pennsylvania Botany Symposium is to provide a venue for amateur and professional botanists to share and learn about the state of botany in Pennsylvania. More than 160 people attended the event due in large part to an expanded program that included other components for botanical inquiry. This year the steering committee offered three hands-on workshops on the identification of sedges, grasses and rushes, and violets on Friday prior to the symposium talks. Workshops of this nature are highly sought after by the botanical community as evidenced by the fact they were the first symposium events to sell



Lisa Smith

Thirty-one people attended the Carex section Ovals workshop led by Dr. Anton "Tony" Reznicek where they learned to identify several of the most difficult sedges in Pennsylvania.

out. In addition to the workshops, PNHP Botanist Steve Grund, developed an outstanding line-up of eight presenters on topics ranging from the history of botanical illustration to biological controls of invasive species to new and interesting botanical finds in Pennsylvania. All of the talks were given on Saturday beginning with a keynote address from Dr. Tony Reznicek about the importance of herbarium collections in the information age. The day of talks ended with an uplifting call to action from Dr. Jim Finley to engage people and encourage them to practice responsible stewardship of their forest resources. As one person put it "Mr. Finley sure ended the day well!!"

Anyone who has ever attended a conference recognizes that socializing and networking are important opportunities to engage in meaningful discussion about anything ranging from current events to what ingredients make the best salsa. The PA Botany Symposium steering committee offered an opportunity for the community to bond around various botanical topics. Dr. Chris Martine of Bucknell University highlighted an evening social with a lecture during which he spoke passionately about the importance of getting students involved in the natural history of their place and engaging them through their primary conduits of communication. He stressed that if we want young people to care about the world we need to be willing to communicate via social media outlets and allow them to utilize these tech tools as a way of getting them engaged in meaningful discussions about the natural world.

Overall the symposium was very well received and we are pleased with the turnout. We saw an increase in

attendance from two years ago and witnessed many smiling faces over the weekend. We hope to continue this trend as we regroup and begin planning for the 2016 PA Botany Symposium. Each member of the steering committee is motivated by the input from people that share comments like these:

"The ovals [sedge] workshop was nonpareil!! Extremely informative."

"The workshop [grasses and rushes] was great, instructor was good..."

"Only better if it [violet workshop] would include a field ID trip."

"Loved Chris Martine's talk; really made me think of doing a better job of getting youth outside and into botany and other natural science."

"Fun, well-run & informative event. Good speakers and great venue. Excellent food."

"Well planned, keeping everyone together for talks allowing for networking and reflection."

"It really helped me think about what I want to work on for my career."

New Leopard Frog

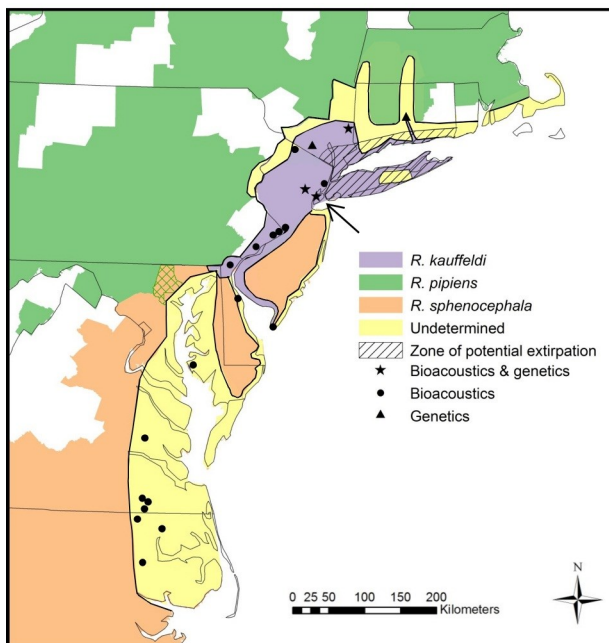
Publication of a new species description (Feinberg et al. 2014) has put a name on the rumored new leopard frog found to occur in coastal zones of the Northeast and Mid-Atlantic states. The species has been named the Atlantic Coast leopard frog (*Lithobates kauffeldi*). It was first discovered in 2011 on Staten Island, NY (Newman et al. 2012). Since then, acoustic sampling and tissue sampling in surrounding states indicated that what was previously assumed to be the southern leopard frog (*Lithobates sphenoccephalus*) may instead be distinguished as *L. kauffeldi*.



Marlin Corn

Recent documentation of the Atlantic Coast leopard frog in southeastern Pennsylvania.

What may seem an exercise in genetic hair-splitting to some actually has conservation implications for most of the nine states in the Atlantic Coast leopard frog's presumed range, including Pennsylvania. Until the states are able to address some basic information gaps, conservation efforts in the Northeast will be challenged with uncertain taxonomic statuses, potentially flawed bases for species and/or site prioritizations, and misappropriations of limited resources for strategic inventory, research, and/or management action. Thus, a 2013 Regional Conservation Needs (RCN) grant was awarded to the New York Natural Heritage Program in order to examine the distribution and conservation status of this species throughout its range. Chris Urban of the Pennsylvania Fish and Boat Commission and Kathy Gipe of the Western Pennsylvania Conservancy, both partners in the Pennsylvania Natural Heritage Program, are collaborators on the RCN grant and have been organizing surveys to find and identify the Atlantic Coast leopard frog in Pennsylvania.



Newly interpreted distributions for all three leopard frog species including *L. kauffeldi*. Symbols indicate known *L. kauffeldi* populations and purple shading depicts areas where our field work has confirmed the occurrence of *L. kauffeldi*. Yellow shading indicates areas of less intensive examination and sampling; *L. kauffeldi* may occur in these areas based on habitat and proximity to known populations. Potential sympatry is also possible in the yellow shaded areas, with *L. sphenoccephala* (from Long Island southward), or *L. pipiens* (north and west of Long Island). The type locality for *L. kauffeldi* is indicated by an arrow.

Extant records for southern leopard frog are limited to Bucks, Delaware, and Philadelphia counties of southeastern Pennsylvania. This species occupies remnants of the commonwealth's Coastal Plain habitat, and was listed as state endangered due to its rarity and setting, surrounded by urban and industrial development. When information about the new species designation came out in 2012, observations by biologists working in the area indicated that these presumed southern leopard frogs were likely to be reclassified as the new species. Coloration and patterning in leopard frogs shows very subtle and cryptic distinctions among the species. It is the breeding call that most easily distinguishes them and that led biologists to identify the Atlantic Coast leopard frog in the first place. In participating in the RCN grant, Urban and Gipe organized volunteers via the Pennsylvania Amphibian and Reptile Survey (PARS) to conduct calling surveys in 2014 at the sites formerly described as occupied by the southern leopard frog. Volunteers recorded confirmed Atlantic Coast leopard frog calls at two of these sites in 2014. Tissue samples were taken from one of these sites for genetic confirmation.

As soon as spring hits the southeast in 2015, the PARS volunteers will again be out to visit the remaining southern leopard frog sites to determine if Pennsylvania is now home to three species of leopard frog (the northern leopard frog, *L. pipiens*, occurs northwest of the other species), or only two. A revised status assessment of the leopard frogs in the commonwealth and an expanded description of the range and habitat of the Atlantic Coast leopard frog across the coastal mid-Atlantic will be the likely outcomes of this project.

Feinberg JA, Newman CE, Watkins-Colwell GJ, Schlesinger MD, Zarate B, et al. (2014) Cryptic Diversity in Metropolis: Confirmation of a New Leopard Frog Species (Anura: Ranidae) from New York City and Surrounding Atlantic Coast Regions. PLoS ONE 9(10): e108213. doi:10.1371/journal.pone.0108213

Federal Work Study Students

It seems like everyone has too much to do these days, and Heritage Data Management is no exception. With so much information coming in, we need to find more ways to get it into the databases where it can do the most good. In the absence of funding for all the full-time staff we could use, volunteers and work-study students can help us fill in the gaps.

The Federal Work Study award program provides employment opportunities on campus or at local non-

profits to qualified students while they are enrolled in college. The purpose of the program is to help students earn a portion of the funds they need to meet their educational expenses. The award pays 60% of the student's salary and the employer pays 40%, using standardized hourly pay rates.

Because of this subsidy, having work study students allows us to get more work done and stretch our funding further. Sometimes we can get the same student returning for many semesters; which is a great benefit since the tasks in Heritage data management often require significant training. We also get the fresh perspective of someone who is trying to make sense of our systems for the first time. It gives us a real push to update our documentation and procedures!

The benefits for the student include getting more exposure to how their education might be applied in the working world, training in information management and current software, and contact with professionals actively working in the field.

We got our first work study student (Lizzie Pfahler) with a State Wildlife Grant from the Pennsylvania Game Commission in 2005-2006. We made great strides improving our bird data during her tenure. Our current work study student is Emily Szoszorek, a University of Pittsburgh Environmental Studies major who has been helping us with various data entry tasks. As you can see in the photo, there is no shortage of work for her to do! Emily says that, "Working here has been an eye-opening experience. I have been able to use Geographic Information Systems here beyond what I was learning in my coursework, and been able to meet a lot of the staff and network."



Emily Szoszorek

Kierstin Carlson

Vegetation Assessment has focused on characterizing plant communities of higher-order streams in major watersheds across the state, while our Shale Gas Monitoring project has established baseline ecological information in focal areas across the state, examining both riparian and upland communities. Although the focus of these projects is not rare species documentation, the breadth of the survey work took us into new areas, where we made new discoveries along the way.

In the course of riparian vegetation sampling in the Youghiogheny River Watershed, a region famous for its botanical diversity, we discovered new populations for several species. In a particularly rich floodplain forest habitat, we found a new population of Carey's sedge (*Carex careyana*), a Pennsylvania Endangered species that is only known from five other locations in the state. It is a species that requires high pH soils, which are limited in Pennsylvania; it is also fairly uncommon throughout its entire range in eastern North America. The watershed that hosts the Carey's sedge also had populations of the watch-list species ginseng and goldenseal.

We found several new populations of mountain bugbane (*Actaea podocarpa*). This is a species of the Appalachian mountains, and southern Pennsylvania is the northern extent of its global range. Mountain bugbane can be distinguished from the plants it most resembles, black cohosh (*Actaea racemosa*) and dolls'-eyes (*Actaea pachypoda*), by the groove on its stem, which extends up onto the stalks of the main leaves. (And yes, we did end up asking each other, as we conducted our surveys, "Is it the groovy one, or not?")



Leaves of mountain bugbane (left). The characteristic grooves in the stem are visible on the main stalk and on the three leaf petioles (right).

Jessica McPherson

Ecological Monitoring Bonus—New Rare Plants

Two of our ecological monitoring projects have taken us to streams and forests across Pennsylvania, and in the process our staff have also encountered several new populations of rare plant species. Our Riparian



American yew, growing on a calcareous outcrop in Blair County, out of reach of the deer.

Jessica McPherson

Through Shale Gas Monitoring site surveys, we also found several new populations of Selkirk's violet (*Viola selkirkii*), and the watch-list species American yew (*Taxus canadensis*) and lettuce-leaf saxifrage (*Saxifraga micranthidifolia*). Selkirk's violet reaches the southern edge of its range in Pennsylvania, and is

found in rich forests in northcentral Pennsylvania. American yew requires higher pH sites, and is also extremely vulnerable to deer browse; it was once more common, but today is found infrequently and usually on a deer-inaccessible but somewhat calcareous rock.

iMap Training

Staff members working with the iMapInvasives program are consistently striving to reach out to individuals and groups who manage invasive species by offering both basic and advanced training courses in iMapInvasives. These training sessions are used to instruct attendees on a variety of topics including the following:

1. The assortment of tools and resources that the iMapInvasives database has to offer with instruction on how to access and make use of each tool/resource.
2. How to enter different data types (such as observation, assessment, survey, and treatment records) in relation to invasive species management efforts being done in the field.
3. The use of iMapInvasives database as a data sharing platform and a "one-stop-shop" in finding information on where invasive species are located within Pennsylvania.
4. How to pull data out of iMapInvasives, either through querying or downloading, for a variety of purposes (e.g., creating maps and reports).

The advanced training sessions offered by staff members are conducted both in-person and via webinar, although users wishing only to learn how to enter observation data may do so by watching a video found on YouTube. Since the start of PA iMapInvasives in March 2013, we have conducted 19 trainings for 209

registered users. The most recent training was held on December 16 for members of the Southern Laurel Highlands Cooperative Weed Management Area (SLH CWMA).

During the advanced training session held for members of the SLH CWMA, all attendees said they were excited to see first-hand the many features and capabilities that the iMapInvasives database has to offer. Additional topics covered throughout the course allowed CWMA members to learn how to record data for areas in which invasive species have been treated as well as how to query data in iMap for grant reporting purposes.

Throughout the training course, several attendees commented that the database seemed like an obvious fit for their CWMA group because it provided a way to capture and share data more effectively between their member organizations.

All iMapInvasives training courses are offered free of charge and all the resources available in the iMapInvasives database are also available at no cost to interested individuals. If you or someone you know is interested in attending an iMapInvasives training session in 2015, please be in touch with Amy Jewitt by phone (412-586-2305) or email (ajewitt@paconserve.org).

New Homepage for iMapInvasives



of Pennsylvania invaders, current news, and instructions on utilizing the iMapInvasives database. Five other iMapInvasives states currently have their own homepages as well including New York, Florida, Maine, Oregon, and Vermont. Pennsylvania is now the newest state to offer this type of unique resource to their iMapInvasives users. If you have ideas for additions to the PA iMapInvasives homepage, please contact a member of the administrative staff by sending an email to imapinvasives@paconserve.org.



SLH CWMA members attend an iMap training session.

Kierstin Carlson

Wild Resource Conservation Program Grants

PNHP will begin work on four new projects in 2015 that were funded through the DCNR Wild Resource Conservation Program.

Assessment of Mussel Habitat, Communities, and Rare Species in the Ohio River: Despite past and ongoing threats, the Ohio River has experienced improvements in water quality since more stringent water pollution regulations were instituted in recent decades. Some fish



Mary Walsh

Salamander mussel

species previously thought to be rare are now known to be relatively common in the river and some preliminary evidence suggests that mussels may also be re-establishing in previously polluted locations.

While recent surveys have provided some insights to what is happening with the aquatic community, mussel communities and habitat in the Ohio River are still under-surveyed. Additional information is needed to evaluate mussel resources, particularly in conditions that are considered the best representatives of habitat in the river. Supplying new data for under-surveyed areas will provide missing information about the presence or absence of endangered, threatened, and presumed extirpated species in these habitats. Our surveys will target potential habitat for the rare Pennsylvania Endangered salamander mussel (*Simpsonia ambigua*) and its host, mudpuppy (*Necturus maculosus*). Another goal of the project is to evaluate potential restoration sites for mussels.



Charlie Eichelberger

We will survey habitat of salamander mussel and its host, mudpuppy (pictured above).

Rare Plant Surveys in Northern Tier Counties: With increased energy development in the northern tier of Pennsylvania, it is increasingly important that data for plant species in Environmental Review be accurate and current. The foundation for accurate and current data on plants of special concern in Pennsylvania is thorough surveys of the habitats in which they grow.

DCNR selected 13 plant species that occur primarily in the northern tier from habitats ranging from acidic headwater peatlands to dry rocky woodlands. Surveys for these thirteen species will be conducted to update aging and historic records as well as to locate new occurrences. The data from these surveys and existing current data will be used to develop a unified and comprehensive dataset and entered into PNDI making it available for DCNR Environmental Review staff and the Bureau of Forestry as a whole.



Scott Schuette

White twisted-stalk (*Streptopus amplexifolius*) is an herbaceous perennial that is restricted to seepy cliffs and rock outcrops in cool, shaded habitats in northcentral and northeastern Pennsylvania. It is a Pennsylvania Threatened species due to the limited number of recently confirmed locations of small populations.

Plant Conservation Status Updates: With over 2000 native plant taxa in Pennsylvania, thoroughly understanding and documenting the right conservation status for all of them is a large and ongoing task. In the late 70s, in the early beginnings of what would become the Heritage Program, botanists took a first look at which species might be rare by listing all of those which had fewer than 60 locations in the Pennsylvania Flora Project. Since then, several decades of botanical survey have revealed that some species were more abundant than they appeared, while others that appeared common have in fact declined. However, there remain many species for which we just don't have complete

information. The Plant Status Updates project has focused on improving our understanding of a list of species identified by DCNR as having uncertain status.

In our first round, we collaborated with other botanical institutions across the state to concentrate on species that needed more fieldwork. We searched for historic records and looked in likely habitats with the aim of providing a well-documented recommendation for the appropriate conservation status (i.e., secure, rare, threatened, endangered) of certain species. In our second round, we will be continuing work on some of these species, and also addressing a new batch that primarily need good summaries of available information.



R. Cox

Yellow fringed orchid

Many of these, like the yellow-fringed orchid (*Platanthera ciliaris*), were identified to need more field work at the Rare Plant Forum in years past and work by the Heritage Program and others has now improved our understanding. Our partners at Morris Arboretum, Cleveland Museum of Natural History, and Carnegie Museum of Natural History have contributed greatly to providing this valuable conservation information to DCNR.

Surveys for Small Cryptic Mammals in Important Mammal Area: From 1946 to 1951, the Pennsylvania Game Commission undertook one of the most comprehensive efforts in the state's history to survey mammals across Pennsylvania. Prior to the Pennsylvania Mammal Survey, information on the state's mammals usually focused on large game species, which often mixed the truth, folklore, and tall-tales together so that reaching a meaningful conclusion on a species status was nearly impossible. The Pennsylvania Mammal Survey was the most expansive effort to gather information that would lead to an understanding of the

distribution and status of the state's mammals. Pennsylvania mammalogists have relied on the reports, range maps, status determinations, and summary publications from the Mammal Survey for decades, but have also realized the limitations of this dated project. Due to the Mammal Survey's age, many of the findings are no longer applicable on today's conservation landscape. Several species, such as the Indiana bat and Allegheny woodrat are regularly monitored by the PGC to chart how populations are faring. Other species, such as the least weasel and rock shrew have had virtually no dedicated survey efforts since the Mammal Survey, and today we can say very little about the current status of these species.

Here we are, nearly 70 years since the first trapline was set for the Mammal Survey, and most of Pennsylvania's forests, farmlands, and waterways have undergone changes -- changes that are evident in the makeup of our flora and fauna. Beginning in 2014, the PGC initiated a new Pennsylvania Mammal Atlas, a project that will focus on determining the current distributions of our mammals. This past year the PGC hired Lindsey Heffernan as the state coordinator for the project. While developing standardized protocols and trap arrays, Lindsey is working to get an interactive website developed. Fieldwork for a pilot project is set to begin in 2015, and PNHP was awarded a WRCP grant to assist with the effort. The focus of this pilot project will be the Central Mountains Important Mammal Area (IMA) where PNHP staff will be working with Lindsey to prioritize field surveys in an effort to document both common and rare species, so that probability models based on habitat types can be developed by the end of the project in 2024.



Charlie Eichelberger

Mammal Atlas Coordinator, Lindsey Heffernan, and Assistant Zoologist, Joe Wisgo, discuss the nuances of mammal identification of a tricky Potter County specimen.

Measures of Progress

The following Measures of Progress represent a significant cross-section of results of the work that we do as a program. These measures will be reviewed and updated, as needed, to best reflect the activities and goals of PNHP. Progress for these measures reflects seasonality of program activity.

Measure of Progress	Annual Goal (2014)	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Cumulative Total	Percent of Annual Goal
Biotics Records Updated	300	213	158	90	63	524	175%
New EOs Documented	800	166	170	162	65	563	70%
New Records Entered into HGIS	350	72	71	71	26	240	69%
Field Surveys Reported	500	4	46	63	145	258	52%
New CPPs Developed	400	160	597	229	217	1203	300%
NHAs Updated	120	0	73	31	240	344	287%
Outreach to Local Government	20	4	4	7	3	18	90%

PNHP performs many functions and provides many services as part of its mission. The measures of progress that are detailed here are meant to capture a number of important program activities and provide a picture of our progress in achieving our essential goals. The program goals and the measures provided for those goals will change over time as we complete certain aspects of our work and as new program responsibilities arise.

Biotics Records Updated indicates the amount of activity expended in improving and updating the more than 20,000 records in the PNDI database.

New EOs Documented is a way to measure the success of our inventory effort in finding new occurrences of elements of ecological concern (plants, animals, and exemplary natural communities). Biotics records are created for each new Element Occurrence documented.

New Records Entered into HGIS indicates our level of activity in reviewing, quality controlling, and entering biotics records into the environmental review data layers. The timely and consistent refreshment of these data are critical to providing protection to the state's species of greatest concern.

Field Surveys Reported is a strong indicator of the effort expended on one of the basic functions of the program – inventory of the state's flora and fauna. Every field visit results in the entering of a field survey, regardless of the outcome of the survey.

New Conservation Planning Polygons (CPPs) Developed is a measure of our progress in creating ecological based mapping for the species and natural communities that we track as part of the PNDI database. Our goal is to have CPPs for all species and communities that we track.

NHAs Updated is a measure of our effort in developing, mapping, and describing sites (Natural Heritage Areas - NHAs) that are important to conservation of Pennsylvania's biodiversity. This process began with County Natural Heritage Inventory projects and will now continue at a statewide level with the updating of existing sites and the creation of new sites. Site polygons will be based upon and consistent with CPPs.

Outreach to Local Government is a measure of our initiative to increase interaction with local government and reflects our commitment to seeing our information used and refined to meet the needs of planning efforts within the counties and municipalities of the commonwealth.