



# Pennsylvania Natural Heritage Program

information for the conservation of biodiversity

## WILD HERITAGE NEWS

Spring 2016



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**Photo Banner:**  
Allegheny plum  
(*Prunus alleghaniensis*)

Steve Grund

## Looking for Spring

by

Charlie Eichelberger, Steve Grund, Betsy Leppo, Ryan Miller, Pete Woods, David Yeany

Biologists at PNHP are first and foremost naturalists, whether they are ecologists, zoologists, or botanists. Any naturalist who has the opportunity to get out in the field in the spring will be making observations on all sorts of species and phenomena. At PNHP, here are some of the things we look for in the spring as we travel around the state.

### *Wildflowers*

The arrival of spring for botanists means the race is on to document the vernal flora often while there is still snow on the ground. Spring ephemerals are only visible for two to eight weeks depending on the species. Early blooming plants that retain green leaves throughout the growing season such as bloodroot (*Sanguinaria canadensis*) are not true spring ephemerals. Spring ephemerals are plants that emerge from the ground in early spring before the trees fully leaf out and complete their yearly chores by early summer. By mid-June, other than perhaps some yellow, shriveled stems and leaves, all that remains are seeds and subterranean roots or stems. This strategy enables these species

to remain small, flowering without expending limited resources to compete for light with taller herbs and woody plants. The following are examples of rare plants that we focus our surveys on in the spring.

Harbinger-of-spring (*Erigenia bulbosa*) is an aptly named plant! It flowers just after it pokes out of the ground, as the leaves just begin to unfurl in early March (once reported on February 20 just six miles south of the Pennsylvania border in West Virginia). The fruits are still around in early summer, but soon after the plant finishes



Harbinger-of-spring

Pete Woods

blooming, the weak stems elongate and fall to the ground, soon to become hidden under a plethora of other herbs on the floodplains where it typically grows. By May it is difficult to locate even if you know exactly where a large population grows. The easiest time to find it is in late March, but the best time to document a population is in April, as the individual plants do not all emerge at the same time, so an early survey may result in a low population size estimate.

Harbinger-of-spring is a true spring ephemeral, the aerial parts withering early, leaving only a spherical subterranean tuber until the next year. The tuber stores starch and other nutrients for the plant to use to initiate growth the following spring.



Pete Woods

Snow trillium

Snow trillium (*Trillium nivale*) is also aptly named, regardless of whether you interpret “snow” as suggesting that it blooms when there might still be snow on the ground, or as referring to the color of the flowers. The Latin epithet *nivale* actually refers to the snow-white color of the petals, but this oh-so-tiny trillium will often bloom before the last snowfall, so most people probably think of the name as reflective of the blooming time. In the unusually warm spring of 2012, snow trillium was observed in bloom at Cedar Creek Park in Westmoreland County on the third of March.

In Pennsylvania, more than a third of the documented occurrences are, or were, in Allegheny County and many sites have been lost to urbanization. It prefers drier limestone-derived soils, usually on steep slopes. Attractive as it is, unless you look for it carefully, you could be standing in a patch of snow trillium in flower and not notice because the petals are only a few centimeters long.



Steve Grund

Allegheny plum

Allegheny plum (*Prunus alleghaniensis*) is mostly restricted to the Allegheny Mountains from North Carolina to Centre County. To identify it with confidence, flowers or fruit are needed. The fruits are not very conspicuous, whereas the white flowers, which bloom before the leaves fully expand, can be spotted at a distance. That leaves us with a few weeks in late April to document this species. These are true plums, but the fruits are small, little over a centimeter (about half an inch) in diameter, most of which is pit.



Fruit of Allegheny plum

Wild hyacinth (*Camassia scilloides*) is a very attractive species that reaches the eastern edge of its range in western Pennsylvania. The delicate flowers can appear



Steve Grund

Wild hyacinth

as a light-blue haze above the forest floor if the population is large. The springy floodplains it inhabits have seen widespread conversion to agriculture, and urban and industrial development. This is a true spring ephemeral, present only as a subterranean bulb once summer sets in.



## Invertebrates

Insects are an incredibly diverse group of animals, and this diversity is reflected in the range of life history strategies that influence when and how they appear in the spring. Different species can overwinter as eggs, as larvae or nymphs, as pupae, or as adults. They can spend the winter underwater, underground, above ground, and a few can even migrate to warmer climates.



Pete Woods

Eastern comma butterflies appear on warm sunny days in early spring, even when there is still snow on the ground.

Our earliest butterflies and moths are the ones that emerge from chrysalises or cocoons in the fall, and overwinter as adults, hiding in protected places under bark and in other sheltered crevices. They become active in spring as soon as the weather is warm enough to allow flight. Moths that overwinter tend to have compact “furry” bodies that allow them to retain enough heat for them to fly. Butterflies that overwinter rely on bright sunlight to warm them enough to fly. These early season moths and butterflies don’t rely on flower nectar, which is in short supply at this time. Instead, they get nourishment from tree sap, rotting fruit, and animal scat. Our overwintering butterflies include mourning cloaks (*Nymphalis antiopa*), commas (*Polygonia* spp.), and tortoiseshells (*Nymphalis* spp.).

By mid-April, we begin to see the spring eclosers. These species time their emergence from cocoons or chrysalises to coincide with the availability of nectar from a variety of spring wildflowers, as well as the emergence of their host plants. Our earliest-eclosing butterflies include the cabbage white (*Pieris rapae*), the West Virginia white (*Pieris virginiensis*), the falcate orangetip (*Anthocharis midea*), several species of elfins (*Callophrys* spp.), and the early hairstreak (*Erora laeta*). Numerous moth species emerge in early spring,

from the common speckled green fruitworm (*Orthosia hibisci*) to the very rare twilight moth (*Lycia rachelae*). Other butterflies and moths overwinter as eggs (such as fritillaries) or caterpillars (such as the well-known woolly bear (*Pyrrharctia isabella*).



Pete Woods

The Isabella tiger moth caterpillar (woolly bear) can withstand freezing temperatures.

Dragonflies do not overwinter as adults in these latitudes. Our earliest dragonflies are usually green darners (*Anax junius*), returning from overwintering hundreds of miles to the south. Most other dragonfly species do not migrate. Species that metamorphose into adults in the early spring include the springtime darter (*Basiaeschna janata*) and the stream cruiser (*Didymops transversa*). Among damselflies, the earliest emergers are often eastern forktails (*Ischnura hastata*), which remain with us throughout the growing season and are also among the latest species seen in the fall.



Pete Woods

Eastern forktail

Among stoneflies (order Plecoptera), it would be difficult to say what the first species of the season are, because numerous species may emerge at any time in the winter when there is a thaw, and live out their entire adult lives before spring. Their adaptations for surviving in the winter include a unique surface-skimming form of flight that works well in cold temperatures when full flight would not be possible. Cold muscles can’t produce enough power for full flight, but with the water surface holding part of a stonefly’s weight, they can generate enough power to move across the water.

## Amphibians

Vernal pools, a unique type of wetland habitat, have their heyday in the spring. They are small, shallow basins in the forest that fill with water in the fall, winter, or spring from rain and snow melt but dry up during the summer. Vernal pools are critical habitat for several kinds of amphibians (frogs and salamanders) that use these pools as nurseries for their developing young. Our most common vernal pool indicator is the wood frog (*Lithobates sylvatica*), a small frog the color of dried oak leaves with a face marked with a black bandit mask and white upper lip. Wood frogs spend most of the year on the forest floor in the uplands surrounding a vernal pool. Also common in vernal pools is the spotted salamander (*Ambystoma maculatum*), a type of mole salamander that spends most of its time hidden in underground burrows. The spotted is a large dark salamander with lines of cheerful yellow spots spanning from head to tail.



Wood frog

Betsy Leppo

Each spring adult wood frogs and spotted salamanders leave the safety of their forest shelters and migrate to the vernal pool where they were born to find a mate and lay eggs. Their aquatic young develop in the pool and must metamorphose into air-breathing juveniles that can leave the pool before it dries. In mid-summer the tiny froglets and mini salamanders leave the pool to find a new home in the surrounding forest where they will feed and overwinter. How far are the wood frogs and spotted salamanders willing to travel between their breeding pools and upland habitats? Wood frogs disperse anywhere from 1 to 7 football field lengths. For a 2.5 inch frog, that's a distance of 1730 to 12,100 body lengths! Spotted salamanders move an average of 1½ football fields, but can travel up to 9 football fields away from the pool. This illustrates a key aspect of vernal pool conservation, that the home range of vernal pool amphibians encompasses much more than the pool itself.



Spotted salamander

Betsy Leppo

The migration of amphibians to seasonal pools in the spring is in response to environmental cues such as air temperature, precipitation, and photoperiod. One study showed that salamander migrations started when evening rains occurred with moderate temperatures over 44.6 F during the day and over 40 F at night. In Pennsylvania, migrations can start as early as the end of February and as late as the beginning of April depending on local temperatures and rainfall. This year in Pennsylvania temperatures were 12-15 degrees above average for a few days at the end of February. This triggered a wave of spring peeper song at a locale in York County.

The spring peeper is a widespread frog of vegetated pools and ponds whose breeding season usually begins with or slightly after that of the wood frog and spotted salamander. Temperatures dipped below average the first week of March and the peepers became quiet. But in the second week of March, temperatures soared to 10-25 degrees above average. Full wood frog and spring peeper choruses exploded at the York County site! By the second weekend of March, raucous wood frog and spring peeper choruses were reported from as far north as Tioga County. Spotted salamanders began their main breeding events during this window of time as well. Every year is a little different, so it's a great reason to go outside and look and listen for these early signs of spring.



Spring peeper calling

Jack Ray



## Reptiles

Many people are aware that all reptiles and other ectothermic (cold-blooded) animals rely on their environment for thermoregulation. That said, these animals have evolved and adapted incredible strategies to ensure survival when environmental conditions become unsatisfactory. One such adaptation is reptilian hibernation which is also known as brumation. When a reptile brumates, it becomes lethargic, sometimes not moving at all for the duration of the winter. These animals typically find hibernacula within their environment where they can be somewhat insulated. A hibernaculum is simply the place where the reptile spends these periods of inclement weather. Burrows, rock crevices, caves, and leaf litter are a few examples of hibernacula documented in nature. In the broadest of terms, reptiles will enter brumation in the late fall when temperatures drop and the days get shorter and come out of brumation in the spring, triggered by increased temperatures, longer days, and changes in barometric pressure.



Garter snake basking

When spring finally arrives, reptiles emerge from their winter refuges and bask in the warm sunshine. Some snakes brumate communally, so when they emerge, they can be found basking in piles. To some, this might be a horrific scene, but to a zoologist it's a true sign of spring. On the right early spring day, spaghetti piles of garter snakes are commonly found near old house foundations, rock walls, and trees with large root systems. Timber rattlesnakes can be found emerging anywhere from a random rodent hole in a hillside to a deep crevice in a rock cliff.

One of the more unique hibernation schemes in Pennsylvania comes from one of our most endangered reptiles. The eastern massasauga (*Sistrurus catenatus*)



Chimney of a crayfish burrow

Pete Woods

*catenatus*) relies on another animal to escape from the doldrums of winter – burrowing crayfish. These species look identical to the crayfish that live in streams but their habitats are seeps and wetlands with soft clay or mud substrates. They burrow deep into the mud and

excavate a chamber in the water table. The excavation leaves a tell-tale mud chimney that can be six inches high. Massasaugas utilize these golf ball size tunnels to access the water-filled chambers which never freeze.

The snakes coexist with the crayfish and they can live in the same chamber together. The snakes stay in the water all winter long and keep their noses above the water level to breathe. As the waters warm the massasaugas emerge from the crayfish burrows and bask in the spring sun. They remain near their crayfish holes for a week or so and retreat down the burrows during the cold nights. Once the ground holds the daytime heat the massasaugas leave the wetlands and forage in old fields and grasslands all summer long. As fall approaches, the snakes return to the wetlands and find a suitable burrow (sometimes the same burrow from the previous winter) for another long, cold, wet winter.



Massasauga rattlesnake in a crayfish burrow

Ryan Miller



## Birds

Pennsylvania is situated in the heart of the traditional Atlantic Flyway in eastern North America where we are able to observe and study one of the greatest phenomena in the natural world – bird migration. Each spring and fall birds make journeys en masse between wintering grounds and breeding sites and back again. In birds, the drive to migrate is influenced by genetic programming, changes in photoperiod, seasonal changes in food resources, and nesting habitat availability.

During spring migration, we see birds which overwinter in Pennsylvania, like red-winged blackbird (*Agelaius phoeniceus*) and horned lark



Tundra swan

Bill Hubick

(*Eremophila alpestris*), among the first to move north from our state when photoperiods lengthen in February and March. Late February also marks the peak of spring waterfowl migration with a diversity of ducks, geese, and tundra swans (*Cygnus columbianus*) making stops along major waterways, lakes, and ponds when ice cover retreats as they make their way northward to boreal breeding grounds in Canada.

Pennsylvania is home to many migratory breeding birds which nest here throughout the summer months. These species may be short, medium, or long-distance migrants, with many of the latter known as Neotropical migrants which spend much of their non-breeding lives in Central and South America. These Neotropical songbirds, such as the scarlet tanager (*Piranga olivacea*) and blackpoll warbler (*Setophaga striata*), migrate



Scarlet tanager

David Yeany

exclusively at night, avoiding predatory hazards. Recent research by Cornell Lab of Ornithology using eBird data has shown that many of these songbirds follow broad migration routes taking them farther inland during spring and farther into the Atlantic Ocean during fall rather than following strict migration paths along the Atlantic coast waterways as waterfowl do. Continued study of songbird migration has increased our awareness of hazards such as reflective glass on buildings and city lights along migration routes and has informed where to conserve important migration stopover habitat to help birds meet the energy demands of migration each spring and fall.

One of the earliest arriving of our breeding Neotropical songbirds is the Louisiana waterthrush (*Parkesia motacilla*). This warbler was identified as a breeding Species of Greatest Conservation Need in the 2015 Pennsylvania State Wildlife Action Plan. It has been well-studied in western Pennsylvania, and many arrive in the southwest counties by the final week in March.



Louisiana waterthrush

Frode Jacobsen

Waterthrushes often travel across the Gulf of Mexico from wintering grounds throughout Central America, the West Indies, and northern South America. From late March to mid-April, migrating Louisiana waterthrushes can be found along forested streams with swift flowing water. Upon spring arrival, males typically sing one of two loud, yet slurring, warbling song types as frequently as six times per minute while establishing a territory. It is this flashy, advertising song that attracts a female and will likely catch a person's attention as well. If you locate a singing male on its perch, it is likely to eventually drop down to forage along the streamside for aquatic invertebrates where one can observe its rock-hopping and tail-bobbing behavior, from which its Latin name is derived.



## Mammals

Depending on the definition of hibernation one follows, 10 out of 54 of Pennsylvania's native, year-round resident mammals hibernate. Three rodents, the black bear, and six species of bats are typically recognized as our hibernators, exhibiting extended periods of suppressed metabolism. Chipmunks, southern flying squirrels, raccoons, opossums, gray squirrels, and short-tailed shrews do temporarily fall into a torpid state to get through particularly cold snaps but are able to quickly wake and regain full consciousness.

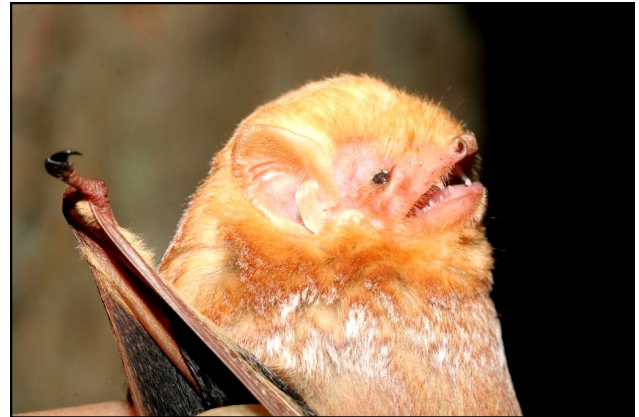
While the woodchuck periodically comes above ground during winter (evidenced by a brown swath snaking across the snow from their dusty fur), for the most part Pennsylvania's prognostic Punxatawny Phil and his wild relatives ride out the cold in their plugged burrows until the first warm day in February. Meadow and woodland jumping mice also hibernate and are particularly vulnerable to cold temperatures. Jumping mouse mortality during hibernation is quite high, and as you would expect, we catch far fewer of these species in the spring compared to surveys conducted in the fall when populations are at their peak.



Woodland jumping mouse

Charlie Eichelberger

Pennsylvania's huge black bears hibernate in natural shelters such as hollow logs, natural depressions, rock shelters, or excavated dens. Their metabolisms and body temperatures are reduced, but not to the degree of the true hibernators, and some have dubbed bear hibernation as "carnivore lethargy." Black bears do not urinate or defecate during hibernation, reserving any resources internally held in place by a fecal plug composed of leaves, pine needles, hair, and intestinal mucus. While in hibernation, female black bears that have bred in the fall give birth to two or three cubs. When born, the cubs are about the size of a guinea pig and grow nearly ten times their size before venturing out of the den in the spring.



Red bat

Charlie Eichelberger

The timing of bat emergence from caves and mines varies by species, but typically occurs from mid-March to the end of April. During this period, bats will use hibernacula as roosts to protect themselves from cold until nighttime temperatures are consistently above freezing. As soon as insects begin to fly, bats gorge themselves to replenish their depleted fat reserves that sustained them during hibernation. Female bats, which have stored sperm in their uterus since breeding the previous fall, initiate fertilization and begin migrating to their summering habitats where females will join other pregnant females to form maternity colonies. These bats mutually benefit from the heat generated by their roommates, fostering the development of their young until they're able to fly, forage, and fend for themselves.

The tree bats, which have overwintered south of Pennsylvania, make their push north to summer habitat often using some of the same travel corridors used by migrating birds. Many of these migrating individuals just pass over Pennsylvania and may head as far north as the forest-tundra transition. Other migrating tree bats spend summers within the commonwealth's extensive forests. In fact, since the decline of those species most affected by white-nose syndrome (WNS), the rufous colored eastern red bat has become one of the most commonly captured species during the summer months.

## Freshwater Mussel Inventories Drive Conservation

by

Mary Walsh, Charles Bier, and Nevin Welte

Lacking the handsome feathers of a brightly-colored bluebird or the fuzzy charm of a bear cub, freshwater mussels are not dear to the hearts of many. Few people outside of the invertebrate science realm care about their fate or even recognize that freshwater mussels are widespread in Pennsylvania's waterways. Until recent decades there were few protections for freshwater mussels. Laws, regulations, and management tools did not exist to protect freshwater mussels from either the insults of industrial waste, sewage, and farming runoff or the effects of habitat alterations like dredging and damming rivers. Arnold Ortmann, the curator of invertebrates at Carnegie Museum of Natural History in the early 20<sup>th</sup> century, decried the extreme pollution fouling the rivers and in his 1909 essay, titled *Destruction of the Fresh-Water Fauna in Western Pennsylvania*, noted that most of the freshwater mussels "have disappeared long ago" from Pittsburgh's Three Rivers.

Ortmann and other zoologists of his era scrambled to document the freshwater mussel species living in Pennsylvania's lakes and rivers as the industrial revolution ramped up in the 19<sup>th</sup> and early 20<sup>th</sup> century. Today, these mussel shells remain in museums – such as the Carnegie – as invaluable documentation of the commonwealth's native fauna before populations were widely destroyed by industrial pollution. Measurable improvements in the state's water quality occurred after clean water legislation in the 1970s required cleanup of industrial discharges. Anecdotal information collected after Ortmann's time gave conservationists hope that some mussel populations persisted despite

the legacy of widespread pollution. Yet, because of this historical environmental degradation and huge data gaps, agencies tasked with protection of freshwater organisms had little concrete information on which to base conservation decisions.



PNHP mussel survey crew in the Allegheny River

PNHP

In the early 1980s as the Pennsylvania Natural Heritage Program (PNHP) was getting underway, one of the early tasks was to inspect the global ranks that were available in order to prioritize attention to those species most jeopardized. Even with rather limited current information in the U.S., it was clear that freshwater mussels were a group that included some of the most imperiled species recorded in Pennsylvania. The PNHP staff was not familiar with this group and had no expertise; however, this changed in that same decade as staff spent significant time studying mussels.

Data provides the foundation for protections granted by state and federal agencies. Basic information needs about the state of freshwater mussels include species distribution, population status, and rarity. Through general inventories and focused projects, PNHP biologists have advanced what is known about Pennsylvania's freshwater mussels. In County Natural Heritage Inventories, PNHP biologists conduct focused surveys in waterbodies with habitat suspected or known to house freshwater mussels in the county under study. As information is amassed in inventories rotating among Pennsylvania's counties, a more complete picture of species' ranges emerges.



Tamara Smith

Clubshell, snuffbox, and rayedbean mussels





PNHP

PNHP biologists sorting mussels by species

Beyond collecting general distribution information, PNHP biologists focus studies in geographic areas of interest that contain unique mussel resources. The rich fauna of French Creek, which drains to the Allegheny River, was the subject of intensive studies on fish and freshwater mussel distributions since the very beginnings of the PNHP. Mussel population parameters and habitat also were evaluated under the scope of a study by PNHP biologists. The study of aquatic resources advanced the state of knowledge about this gem of a watershed and also gives weight to conservation of lands along French Creek, helping to protect the freshwater mussels. The French Creek watershed continues to be a high priority conservation target of Western Pennsylvania Conservancy and a number of other organizations. WPC has protected a number of properties along French Creek, its tributaries and elsewhere in the watershed.

Many species of mussels survive in highly altered habitats. Built to create navigable water depths for the



PNHP

Mary Walsh and Beth Meyer SCUBA diving for mussels

barges shipping goods to and from industries on the Allegheny River, eight locks and dams changed the free-flowing character of the river. The once shallow gravel riffles and runs became deep pools and sediment traps as silt filled in behind the dams. While some cursory information existed about the pools, what lived beneath the depths was generally unknown. Tasked with investigating the habitats in the pools, biologists found that the mussel species which prefer the faster-flowing waters found refuge in the swifter currents downstream of the locks. The greatest number of species of freshwater mussels occurred in the shallower parts of the pools with minimal silt. Few species can tolerate the thick sediment and none occur in the deepest parts of the pools. In this “working river” the studies of the freshwater mussels lend information to decisions about the management of these mussels and their habitat.



PNHP

Zebra mussels attached to a mapleleaf mussel

In another study, PNHP biologists investigated what happened to native mussels 20 years after a catastrophic population crash. In the 1990s zebra mussels invaded Lake Erie blanketing the hard surfaces in the lake, including native freshwater mussels. As a result of this event, the Presque Isle Bay native mussel population declined dramatically from their once high numbers to almost none in a few short years. In collaboration with regional universities, biologists surveyed the bay to assess the remaining species and their numbers. Today a few individuals of a limited mussel community persist in the bay. This work helped fill in the broader picture depicting a rebound of freshwater mussels in the Great Lakes.

On the other side of the state, PNHP biologists investigated freshwater mussel communities and populations in the Delaware River and Susquehanna





Mary Walsh

Yellow lampmussel

lampmussel was thought to inhabit a relatively small number of waterways in Pennsylvania. Revisiting historic locations and other likely habitats, biologists discovered that the species has an expanding range. We also found that the green floater was unexpectedly widespread in the large river habitats, but that there was evidence of the brook floater's decline within the watershed, giving scientists cause for concern.



Beth Meyer

Susquehanna River at Vinegar Ferry

Another study in the Delaware River basin revisited historic habitats and characterized the remaining habitats for the Pennsylvania-endangered eastern pearlshell. These mussels are hypothesized to have persisted during glaciation in parts of the Delaware watershed south of the glacial extent; thousands of years later the populations there were decimated by pearl hunters and toxic effluents from coal mines in the early 1900s. In the PNHP study, the pockets of habitats in unpolluted waters were evaluated and a previously unknown population was discovered in a new location. Distribution and abundance information will be paired with the



Mary Walsh

Eastern pearlshell mussel

results of a partner project that is collecting data about the genetic diversity of the species. Understanding the genetic diversity in the Pennsylvania populations and their relatedness to other North American populations will contribute to the conservation of this species.

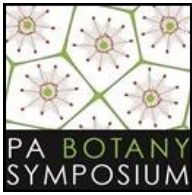


Mary Walsh

Delaware River at the Upper Delaware Scenic Recreation Area

Over the past three and a half decades the Pennsylvania Natural Heritage Program has and continues to aid aquatic science initiatives and conservation by amassing information about the state of Pennsylvania's freshwater mussels. PNHP research and inventories provide a baseline for future monitoring and aid in species status assessments. We contributed to a regional assessment of brook floater in the northeastern United States, which is evaluating the species' range for a potential federal status assessment. Additionally, our studies assist state management of aquatic resources; specifically the results are applied to evaluation of the conservation ranks for freshwater mussels. The information compiled from PNHP studies provided a foundation for a 2014 revision of state conservation ranks (S-ranks) approved by the Pennsylvania Biological Survey's Bivalve Subcommittee. Information about distributions, populations, and threats collected in PNHP surveys provided an assessment of freshwater mussels for the Pennsylvania Wildlife Action Plan completed in 2015. Planned work in 2016 includes gathering information to assist with management of the freshwater mussel resources in the Ohio River and evaluating the state status of the brook floater.





## 2016 PA Botany Symposium

November 18 and 19, 2016

The Pennsylvania Botany Symposium Steering Committee is proud to announce the 3<sup>rd</sup> biennial PA Botany Symposium. This meeting of academic, professional, and amateur botanists will be held at The Penn Stater Conference Center Hotel in State College on November 18 and 19. One of the primary goals of our symposium is to increase student involvement with and appreciation of botanical sciences. In an effort to achieve this goal we added a poster session for students of botany where they can share their research with the Pennsylvania botanical community.

People spoke and we listened, so we will be offering an expanded workshop schedule to include four all day workshops and two half day workshops.

### Workshop Topics and Presenters

- The Rushes: Wesley Knapp, Maryland Natural Heritage
- Aquatic Flowering Plants: Barre Hellquist, Massachusetts College of Liberal Arts
- Sections of Carex: Dwayne Estes, Austin Peay State University Herbarium
- Grasses: Sarah Chamberlain, Penn State University
- Willows: Jim Bissell, Cleveland Museum of Natural History
- Ferns: Bonnie Isaac, Carnegie Museum of Natural History and Steve Grund, Pennsylvania Natural Heritage Program

Following the workshops and student poster session, will be an evening presentation with Chris Martine, the David Burpee Chair in Plant Genetics and Research and Director of the Manning Herbarium. He and his students recently described a new species of tomato from Australia honoring Mark Watney from the book and movie "The Martian."

In addition to the lineup of workshops, the all-day symposium session on Saturday, November 19 will include talks on native plant conservation, the Lewis and Clark Herbarium, ecological stewardship, river scour plant communities, ecology of aquatic plants, and the ancient wisdom of mosses. This year's symposium features a keynote address from Reed Noss, a naturalist, ecologist, distinguished professor of conservation biology at the University of Central Florida, and author of *Forgotten Grasslands of the South: Natural History and Conservation*.

Stay tuned to [www.pabotany.org](http://www.pabotany.org) as we continue to develop the 2016 PA Botany Symposium.



Bog sedge

Scott Schuette



Butterfly milkweed

Scott Schuette

## Notes from the Field

### Heritage Information Management

Heritage programs across the continent face the constant challenge of processing all of the information coming in from the biologists on staff, the government agencies and scientific institutions they partner with, trusted consultants, and even citizen scientists. Entering data into the standardized Heritage program database called Biotics is a complex process which must be undertaken with great care to make sure the resulting records are reliable enough for serious research and legal applications.

A 2014 survey of over 30 Heritage programs revealed that the backlog of data waiting to be entered is either staying the same or increasing for almost all of them, including PNHP. Over the past year, PNHP Information Managers have participated on the NatureServe Data Backlog Committee, working with representatives from other Heritage programs to find ways to expedite data entry without sacrificing quality. Their suggestions include significant database restructuring that will be considered by NatureServe as they continue to develop the system over the next several years.



JoAnn Albert

Wood turtle, a Species of Greatest Conservation Need

The most immediate improvement, of course, would come from hiring additional data processors. Because of the acceptance of the Pennsylvania Wildlife Action Plan by the U. S. Fish and Wildlife Service, Pennsylvania has access to federal funds through the State & Tribal Wildlife Grants Program. Two of the grants we are receiving through this program are the Fish, Reptile, and Amphibian State Wildlife Grant and the Bog Turtle

State Wildlife Grant. The funding from these grants enables us to enter the thousands of observation records for Species of Greatest Conservation Need being amassed by the Pennsylvania Fish and Boat Commission into the Heritage database and the Environmental Review system. By combining these grants with our core funding from the Pennsylvania Department of Conservation and Natural Resources, we have been able to hire an additional full-time staff person to address the needs of the grants and other long-standing data processing needs as well.

Heritage Information Management would like to introduce its newest staff member, Emily Szoszorek, who began work on February 1, 2016. Emily was perfectly prepared for the position, having very recently been our Federal Work Study Student from the University of Pittsburgh for two semesters, and then continuing on with us as a volunteer. She learned the basics well during that time, and enthusiastically started right in on her first day, learning the nuances and digging deep into the data to make sure that the Heritage database records, and therefore the basis for the Environmental Review / Conservation Planning Polygons, are as accurate and completely documented as possible. Emily graduated in May 2015 from the University of Pittsburgh with a Bachelor's Degree in Environmental Studies, which included an internship in their horticulture department and a GIS project evaluating the efforts of the Western Pennsylvania Conservancy's invasive species management at Wolf Creek Narrows, Butler County. She has also worked for the Phipps Conservatory Botanical Garden.



Kierstin Carlson

Emily Szoszorek, Heritage staff

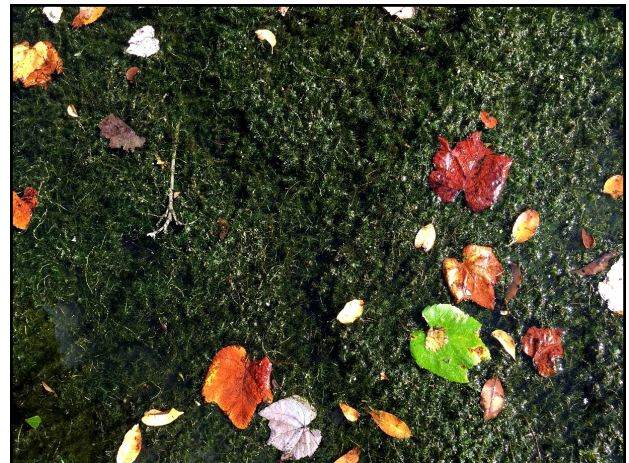
Other species that will benefit from our increased data processing capacity include federally listed bats, freshwater mussels, and plants, all of which are seeing a spike in the amount of information coming in to Heritage Information Management.



## Hydrilla More Prevalent Than Expected

In the summer of 2015, an aggressive aquatic invader known as *Hydrilla verticillata* was found in a part of Pennsylvania where it was not known to exist before: the Lake Erie watershed. (News on this finding was mentioned in the Winter 2015-2016 issue of the PNHP Wild Heritage News.) This finding was crucial in the effort to understand the distribution of hydrilla across Pennsylvania, since it is currently considered an Early Detection species in our state (i.e., a species not widely established and which has a greater likelihood of being controlled or eradicated if detected early). If left unchecked, hydrilla could devastate much of the habitat of our native aquatic flora and fauna as well as impede recreational and commercial activities. Like many invasive species, hydrilla spreads quickly and a rapid response to new invasions is necessary to control it.

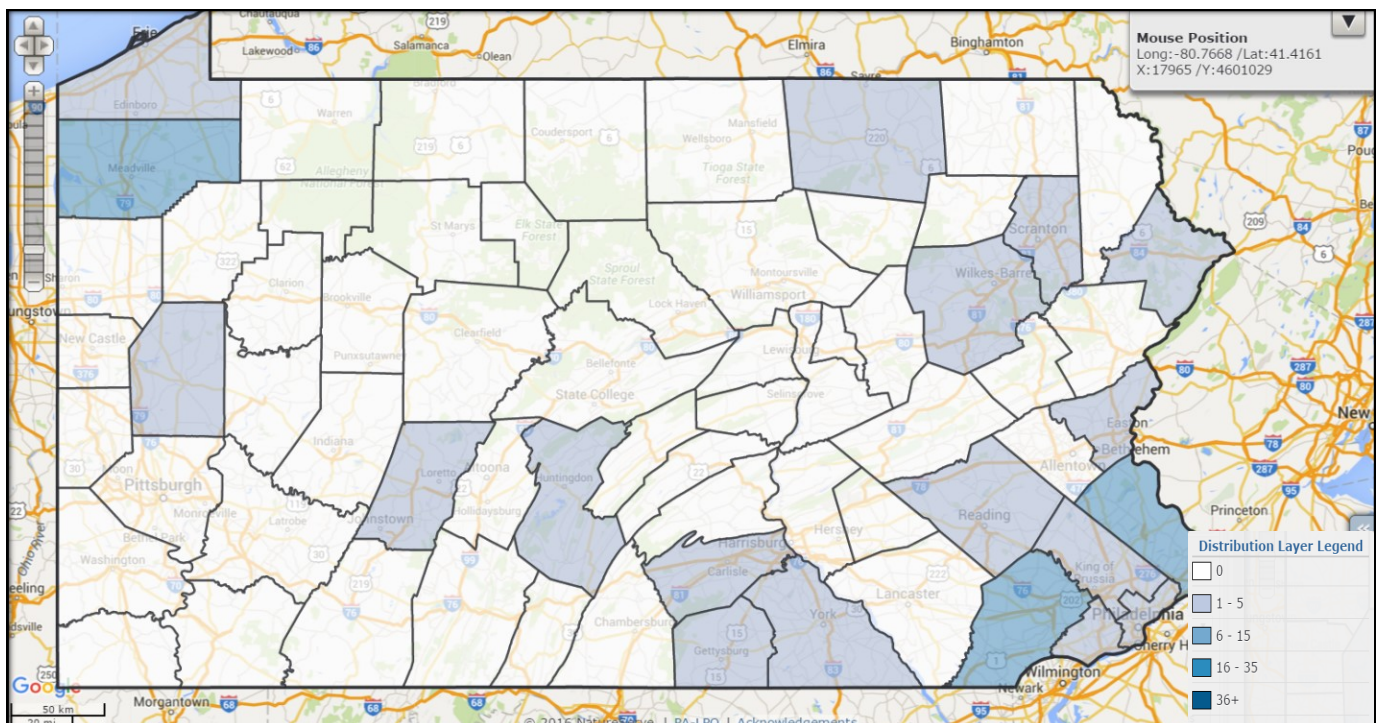
Currently, the Pennsylvania Department of Agriculture (PDA) along with various governmental and non-governmental organizations is spearheading an effort to eradicate hydrilla populations in Pennsylvania before the species has a chance to spread to other parts of the state. To aid in this effort, Amy Jewitt, PA iMapInvasives Coordinator, conducted an analysis of hydrilla data from various online databases to develop a comprehensive list of hydrilla-infested counties and the impacted waterbodies within each county. This data



Pete Woods

A pond in Erie County that is heavily infested with hydrilla analysis indicated that hydrilla is much more prevalent in Pennsylvania than expected and proved to be invaluable in the early stages of PDA's planning efforts on how best to manage it.

At this time, hydrilla is known to infest 19 Pennsylvania counties comprising 32 waterbodies (or sections of a waterbody such as a large river or downstream from an infested reservoir), all of which are documented in the Pennsylvania iMapInvasives database. Two records remain unconfirmed at this time, pending confirmation.



Counties in Pennsylvania with Hydrilla infestations; map legend indicates the number of observation records reported to iMapInvasives.



## WRCP Grants

The Heritage program through the Western Pennsylvania Conservancy and with partner organizations received funding for five new projects from the Wild Resource Conservation Program. These grants often complement or support projects that are already active under our core funding from the Department of Conservation and Natural Resources.

### Brook Floater Mussel in the Susquehanna River Basin

The brook floater (*Alasmidonta varicosa*) mussel is one of the rarest species in the Susquehanna River basin. Although the species was once widespread in the commonwealth, the significant range decline and decrease in brook floater population sizes suggest that the species is reaching a critical threshold for conservation. We will evaluate the current status of the brook floater through review of existing records to determine gaps in distribution information and complete field surveys in historic and potential locations. Updated occurrence information and density estimates will assist in an assessment of the criteria for a Pennsylvania Endangered or Threatened status.



Mary Walsh

Brook floater mussel

### Invasive Plants Watch List

Early detection and rapid response are two integral components of effective invasive species management. PNHP staff will develop a Plant Invader Watch List for Pennsylvania for non-native or exotic plant species that threaten to invade native ecosystems in the commonwealth within the next ten years. As part of the project Heritage staff will develop invasiveness rankings (I-Ranks), an informational brochure, and species profiles that describe native and introduced ranges, invasive impact, identifying characteristics, and additional resources.



JoAnn Albert

Because vernal pools are temporary wetlands, animals that depend on them are adapted for both aquatic and terrestrial habitats.

### State Park Vernal Pool and Upland Habitat Assessments

Vernal pools are unique wetland habitats where some of the state's most recognizable reptiles and amphibians can be found. This collaboration between Clarion University and the WPC Heritage Program will inventory vernal pool species, map, and describe known and new field-verified vernal pools, and survey targeted upland habitats for amphibians and reptiles in ten priority state parks. A summary report will assess conservation rankings and provide management recommendations for each park.

### Digger Crayfish Distribution and Conservation

North America is home to a diverse, ecologically important crayfish fauna that is highly threatened by human activities, and recent conservation assessments show that about half of North America's crayfishes are imperiled. Prior to 2014, Pennsylvania's burrowing crayfish had not been the focus of a survey since 1906. In partnership with West Liberty University, we will determine the distribution and conservation status of digger crayfish (*Fallicambarus fodiens*) populations in Pennsylvania as the first step in the creation of a management plan for this ecologically significant crayfish.



Zachary Loughman

First collection of the digger crayfish in Pennsylvania



### Climate Change Vulnerability Assessment

Heritage staff will use NatureServe's Climate Change Vulnerability Index (CCVI) tool to analyze a list of high priority plant species at the northern or southern edge of their ranges. Plant species vulnerable to changes in temperature and precipitation may shift either north or south depending on their physiological tolerances. Plants at the southern edge of their range are likely to be lost from the state as they migrate northward while being replaced by species with more southern distributions. This project will provide valuable CCVI assessments to assist DCNR with their goal to update regulations for selected plant species of concern. The CCVI data generated during this project will also inform PNHP ecologists about climate vulnerable species in terrestrial and palustrine communities.

### **DCNR Launches New PA Conservation Explorer**

Department of Conservation and Natural Resources Secretary Cindy Adams Dunn announced that the department and its partners have launched PA Conservation Explorer to assist businesses, local governments, and citizens with conservation planning, and improve the process for environmental reviews for threatened and endangered species that are required during permitting for construction and other activities.

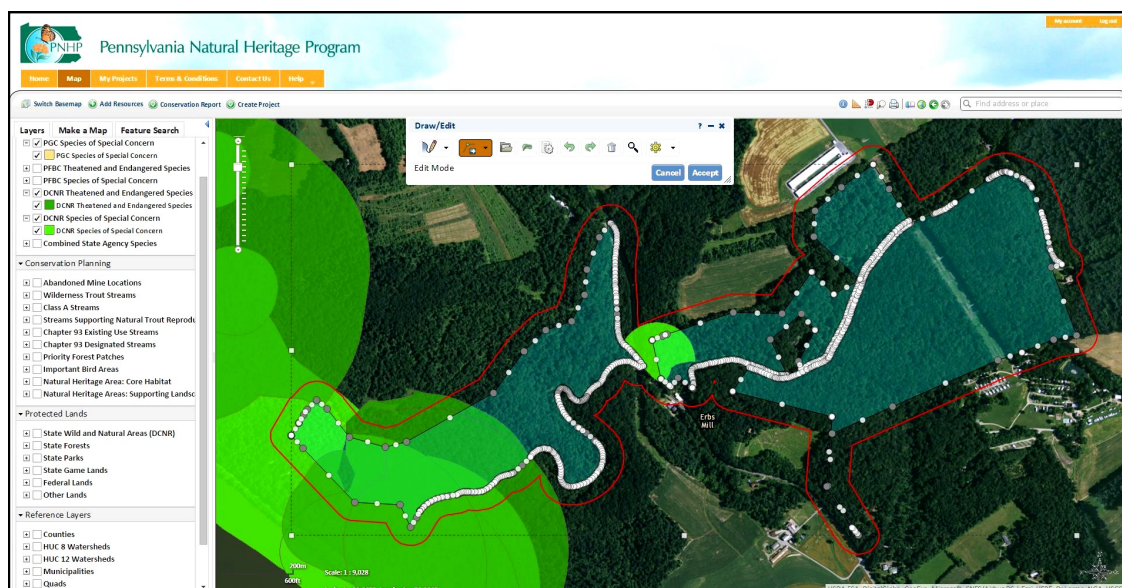
"A government that works efficiently makes it easier to evaluate the impact that projects will have on our threatened and endangered species so that they can be avoided through the planning and permitting processes," Dunn said. "For the first time, species

habitat information will be available online, and applicants can submit projects electronically, replacing a cumbersome process that required paper submissions to four different agencies."

PA Conservation Explorer replaces the Pennsylvania Natural Diversity Inventory Environmental Review Tool (PNDI). The new tool provides conservation information on biological diversity, protected lands, streams, and other natural resources for planning purposes. It also allows users to screen a project area for potential impacts to threatened, endangered, and special concern species. The tool does not list specific locations for species, but instead shows the species habitat.

There is a \$40 convenience charge when submitting a project for environmental review that is part of the PA Conservation Explorer. Users without access to a computer or who do not wish to use the convenience option may submit their project for review directly to each of the four jurisdictional agencies. Jurisdictional agencies are DCNR, plants; Pennsylvania Game Commission, birds and mammals; Pennsylvania Fish and Boat Commission, fish, reptiles and amphibians; and the U.S. Fish and Wildlife Service, federally-listed species. The Conservation Explorer maps and information are otherwise free for use.

To learn more about Pennsylvania's diversity of species and natural heritage visit [www.naturalheritage.state.pa.us](http://www.naturalheritage.state.pa.us).



PA Conservation Explorer offers new ways to discover potential impacts to rare, threatened and endangered species habitats.

## 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 (2016)	1st Quarter	Cumulative Total	Percent of Annual Goal
Biotics Records Updated	300	66	66	22%
New EOs Documented	800	189	189	24%
New Records Entered into HGIS	350	0	0	0%
Field Surveys Reported	300	159	159	53%
New CPPs Developed	400	0	0	0%
NHAs Updated	150	15	15	10%
Sites Actively Monitored	35	0	0	0%

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.

**Sites Actively Monitored** indicates how many established geo-referenced plots that we visited and sampled. These sites allow us to collect data on structure, species composition, and physical context (soils, hydrology, etc.) in a systematic way and by following the same protocols to directly compare future data to previous data.