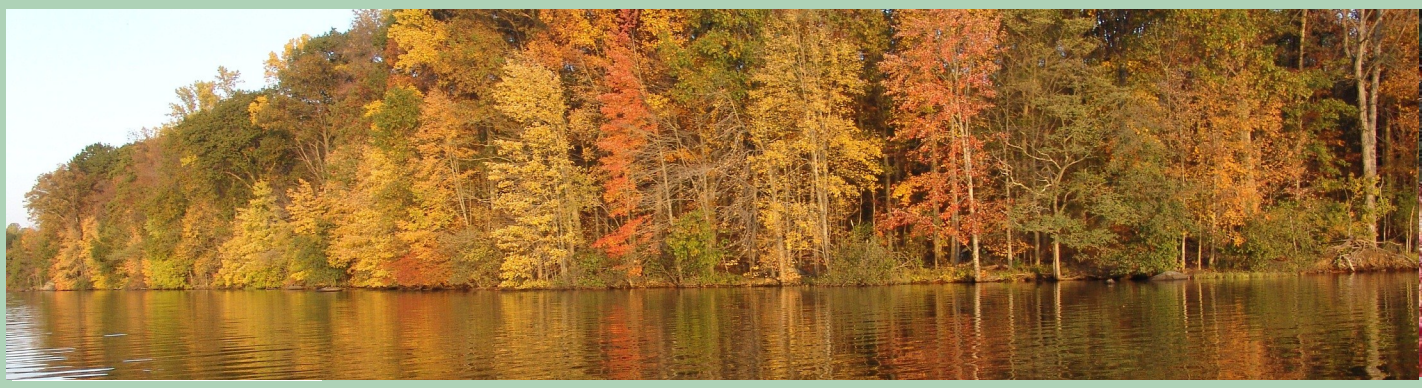
Pennsylvania Natural Heritage Program

information for the conservation of biodiversity

Wild Heritage News July—September 2013



Inside This Issue

Photo Banner: Sally Ray

Fall colors on Pinchot Lake, Gifford Pinchot State Park

Invasive Aquatics: Lessons from Three State Parks

by

Steve Grund

There is a world of plant life that most people are only vaguely aware of. Under the surface of our lakes, in the shallow portions where light penetrates near the bottom, is a veritable forest of highly-specialized plants, very different than those that live on land. We are more familiar with the emergent plants like cattails, which grow in very shallow water at the edges of lakes and in other wet places; plants that have their feet in the water, but also extend above the surface. Emergent plants are sometimes included in a broad definition of aquatic plant, but here we will be focusing on submerged aquatic plants; specifically three examples of exotic alien species we encountered in recent work with the Bureau of State Parks.

There are 120 state parks in Pennsylvania. Most, if not all of the parks have water bodies suitable for recreational activities like canoeing, swimming, and fishing. The Pennsylvania Natural Heritage Program has been working with the Bureau of State Parks to evaluate aquatic systems in selected parks: Gifford Pinchot, Canoe Creek, and Shawnee. All three have lakes created by impounding streams.

A primary goal of the study is to provide information to guide management activities for the lakes. A major part of the work was to survey the aquatic plants at each lake. Using kayaks and armed with hand lenses, grappling hooks, and a GPS unit, we worked around the edges of the lakes, where the water is shallow enough to support plant growth. We gauged the density of each species of submerged

Betsy Leppo

Kegg Run Inlet, Shawnee State Park

aquatic plant at each point, and noted the extent and general composition of any adjacent marsh habitat.

Sarah Parker

Aquatic plants usually cannot be observed directly from a boat, so we pull up samples with a grappling hook attached to a rope.

Despite significant on-going efforts to control invasive species, we found the aquatic floras of these lakes were dominated by a handful of species that are not native to our region. This was not surprising, as this is the case for the majority of impounded lakes and many natural lakes in Pennsylvania. The only native submerged aquatic plant that is common at these lakes is coontail (*Ceratophyllum demersum*); it is one of the dominant species at each lake in the study. We found other native submerged aquatic species, but none were very common.

Aquatic plants are critical components of lake ecosystems, providing food and shelter for fish and other aquatic animals, oxygenating the water, cleaning the water by recycling nutrients and removing toxins, and stabilizing sediments. Ecosystems are complex associations of organisms interacting with each other and the associated physical environment. Changing the ecosystem components can have profound impacts on the functions of the system, with myriad consequences both to the species involved, and to people who benefit from the services of the ecosystem. When invasive aquatic plants displace native species in lakes, ecosystem functions are degraded. Lakes, especially those formed by damming streams and therefore without a long-established native flora, are particularly vulnerable to invasion by alien plant species. Unlike our native aquatic species, some of these invasive species can grow so dense that boating, even by canoe or kayak, becomes nearly impossible. Non-native plant species typically are not adequate substitutes for native plant species as food and shelter for native fish and other animals.

Complete eradication of these invaders is an unattainable goal, but they can be managed at tolerable levels, albeit with difficulty. What works to manage one species is not always effective for another, so it is critical to know when additional invasive species arrive, as well as what management strategies are currently available and have been found to be effective. The three species featured below were the primary offenders at the three state parks we studied this summer.

Eurasian water-milfoil (*Myriophyllum spicatum*)

Eurasian water-milfoil like many submerged aquatic plants has deeply dissected leaves.

The water-milfoils have whorled leaves, which are divided into narrow linear segments like a two-sided comb. By June, when most of our native aquatics are just getting started, Eurasian water-milfoil plants may already extend to near the surface of the lake, even in water up to about ten feet deep. Eventually, if no steps are taken to control growth of this upstart, the plants branch and spread out over the surface of the lake, shading out the plants below, greatly impeding navigation, and making it unpleasant at best for people to swim. This is probably the most well-known invasive plant species in our region, because it has been a problem for a long time (it arrived in the state about 1950). We found it at all three parks we studied this summer, but at least in part due to attempts to subdue it, it is no longer the most problematic aquatic invasive plant in parts of these lakes.

These waters are choked by Eurasian water-milfoil, which impedes boating and makes swimming undesirable. It displaces native plants, which in a healthy lake grow at lower densities and deeper in the water.

Waternymph (*Najas minor*)

Najas minor (waternymph) has teeth that are visible to the naked eye later in the season.

The common name "waternymph" covers all species in the genus Najas, which is represented by several native species as well as a few alien species in Pennsylvania, so it is best to use the full Latin name, *Najas minor*. Waternymphs are annuals with opposite, narrow, toothed leaves. The flowers rely on diffusion through the water column to transfer pollen, but manage to produce a large number of seeds by producing a large number of flowers. In late summer, *Najas minor* plants contract and become brittle, eventually breaking into roundish segments several inches across that float near the surface of the water, resembling aquatic tumbleweeds. Fragmentation is a commons means of vegetative propagation for aquatic invasive plants.

Adaptions for life in the water

Don Cameron, Maine Natural Heritage

Water marigold (*Bidens beckii*) has very divided leaves under the water, but it holds its flowers above the water where it produces leaves more typical of terrestrial plants.

Fresh water and air are very different environments, and they produce different challenges for plants. It is therefore to be expected that aquatic plants exhibit traits that are uncommon or unknown in terrestrial plants. Books have been written on the subject, but we will highlight just a few that are demonstrated by the three species we have described.

Leaves divided into very narrow segments is a common feature among plants that live under water, but this feature is found only occasionally among plants with aerial leaves. In fact, some species that produce leaves both below and above the surface of the water make leaves with narrow segments below, and leaves with broad segments above the water. The primary reason for this difference is that gas exchange is much more challenging in the water, while water loss, a big issue for many terrestrial plants, is obviously not an issue in fresh water. If you were to take a leaf of, say, a rubber plant, and divide it into narrow segments with a razor blade, you would not change the volume of the leaf, but you would greatly increase the surface area. A larger surface area compared to volume increases the amount of water evaporation, and also allows for more gas exchange, thus the tendency for finely divided leaves in the water and broad leaves in the air.

Plants that grow where winters are cold have various strategies for surviving the season. Annuals (including many aquatics) overwinter primarily by producing seeds that do not sprout until spring. Some woody plants, evergreens such as pines and rhododendrons, mostly just slow down, and have certain structural and chemical mechanisms to minimize the effects of freezing temperatures. Most woody plants shut down more completely above ground by reabsorbing nutrients into underground organs and dropping their leaves. This is accompanied by the production of "winter buds," shoots with crowded tiny leaves with little stem intervening. These are usually protected with a covering of hardened, modified leaves called bud scales. In the spring, the winter buds germinate, the bud scales fall away, the stem elongates, and the tiny leaves expand to normal size. Winter buds are also formed by many aquatic species, but they are different than those produced by trees so we have another word for them, "turions."

Turions are found in a large number of aquatic plants in distantly related families. Like the winter buds of woody plants, the primary feature of turions is small, closely spaced leaves. Rather than producing bud scales like most woody plants, all the leaves of the turion are typically hardened, and the first typical summer leaves are formed anew after the turion expands in the spring. As one would expect in a diverse group of organisms, there are many variations on the basic plan. The variety of specializations for living under different conditions is part of the wonder of diversity, and what makes the study of nature so endlessly fascinating.

First documented in Pennsylvania in 1951 (an 1865 record is suspicious), we have only recently recognized this plant as a major invasive species in the state. In 2007, we found *Najas minor* growing at the north end of Canoe Lake. The population was fairly large and dense, but restricted to the area where Canoe Creek enters the lake. We wondered if it would spread. It did. In 2013 we found it to be the most common species in the lake, supplanting Eurasian water-milfoil for that dubious distinction. Perhaps *Najas minor* is the better competitor under the circumstances, but the circumstances include management directed at controlling Eurasian water-milfoil. It is also problematic at Gifford Pinchot and Shawnee lakes, and may be on the increase in those lakes.

Hydrilla (*Hydrilla verticillata*)

Hydrilla is the most recent of our three featured invasive aquatic plants to reach Pennsylvania, first documented in 1998, and it may become the worst, at least in the warmer parts of the state. It looks very much like its native close relatives, the waterweeds (*Elodea canadensis* and *E. nuttallii*), but has 4—8 leaves in a whorl (compared to 3 in the waterweeds) and conspicuously toothed leaves.

Like Eurasian water-milfoil, hydrilla branches extensively at the surface, shading plants below and interfering with swimming and boating. Many aquatic plants, including hydrilla, produce specialized buds called turions in the fall. The turions break off and settle to the bottom of the lake, where they sprout the following spring. Hydrilla also produces abundant small overwintering tubers and bountiful seeds. This trio of reproductive strategies, along with an especially high rate of growth, enables this species to often quickly become the dominant species within a few years of introduction into a lake. The specimen we collected at Pinchot Lake was the first formal documentation of the species from York County, but the plant is already the most common aquatic plant in the lake. We did not encounter it at Canoe Lake or Shawnee Lake, but it is now known from the Ohio River and other sites in the western part of the state, so we must prepare to find it increasingly common.

Hydrilla can branch at the surface and almost completely fill the water column.

New York Dept. of Environmental Conservation

The primary means by which aquatic invasive plants are introduced into lakes is by boats and trailers. Please do your part to help prevent the spread of invasives. For more information http://fish.state.pa.us/cleanyourgear.htm

In addition to these three species, there are many other serious aquatic invasive plants that threaten the ecology and recreational uses of Pennsylvania's rivers and streams, including fanwort (*Cabomba caroliniana*), European frog-bit (*Hydrocharis morsus-ranae*), and Brazilian waterweed (*Egeria densa*). The increased presence of aquatic invasive plants does not mean we will lose all or most of the ecological and recreational functions of our aquatic resources. However, management is difficult, expensive, and always seems to involve choosing between different strategies, all of which have non-trivial negative consequences. The consequences of doing nothing, however, are usually worse than any of the management options.

Species Highlight: Fly Poison Borer Moth

by

Betsy Leppo

Betsy Leppo

Adult female fly poison borer moth

On a global scale, Pennsylvania's temperate forests are not considered a hotbed of diversity when compared to tropical rainforests. None-the-less, there are species that are uniquely adapted to the climate and vegetation found in the commonwealth. One such species is the fly poison borer moth (*Papaipema* sp. 1). This species was first discovered in northeastern Pennsylvania in the 1970s by Dr. Eric Quinter of the American Museum of Natural History. It has not been formally named yet, so it has been assigned a temporary number (species 1). Since its discovery it has been found in twelve counties, ranging west to east from Cameron to Monroe County and south to Dauphin and Berks counties. This moth is currently only known from Pennsylvania sites, but further surveys may uncover it in neighboring states that have fly poison.

The fly poison borer is a medium sized moth with dark reddish wings marked with creamy-white spots. Adults emerge in September through early October to mate and lay eggs. The caterpillars feed upon fly poison (*Amianthium muscaetoxicum*), a plant in the lily family. The scientific name combines fly (*muscae*) with poisonous (*toxicum*). Fly poison has unique toxic alkaloids in its leaves and bulb that can be fatal to cattle and sheep who consume it. Root extracts mixed with sugar were used by early settlers as a housefly insecticide.

Betsy Leppo

Fly poison

Fly poison grows in open woods, barrens and bogs, in sandy or peaty soils. In the wild, fly poison borer caterpillars can only feed upon this plant, therefore distribution of the moth is limited to areas with extensive populations of host plant. However, not every good population of the host plant has been found to support the borer moth. There appear to be other factors that affect the distribution of the moth, but those factors are not currently known. Conservation of the larval host plant and surrounding forest is the main tool for protecting this species.

Betsy Leppo

Fly poison habitat

This summer, Pennsylvania Natural Heritage Program staff continued revisiting old records of species of concern found on Pennsylvania Game Commission lands to see if target species are still present and to check on the condition of their habitat. Several old records for fly poison borer moths were on the list of sites to revisit. Finding adults involves setting up blacklight traps in their habitat. Timing the survey can be tricky since the adults are in flight for a short period of time at a given site, and the window of opportunity to find them can shift from year to year. Weather conditions at night are especially important when looking for fall-flying species, which makes it even more difficult to schedule a survey for the perfect night.

After talking to a researcher who has successfully found fly poison borer caterpillars, I decided it might be easier to find them in their larval stage. The best time to look for mature caterpillars of this species is early to mid July.

Betsy Leppo

With a plant and insect collecting permit in hand, I began searching at a site with abundant fly poison for plants that had some brown and wilting leaves.

Betsy Leppo

I used a small spade to remove the whole root bulb. After digging up several plants I found a bulb occupied by a large caterpillar which promptly fell out of the bulb into my hand.

Betsy Leppo

Fly poison caterpillars like to keep a tidy home, so they push their waste out of the bulb. As I examined other plants I began to notice that some had a substantial amount of caterpillar frass at the base of the leaves.

I also found that plants with multiple bulbs or a particularly large single bulb could support two or three caterpillars.

Betsy Leppo

In mid-July I brought three caterpillars home from the field to rear, to make sure I had indeed collected a fly poison moth caterpillar. After a few days I could only find one caterpillar, and learned that if they do not have enough of their favorite poisonous plant to eat, they will consume their roommates. In early August the winning cannibal successfully pupated.

Betsy Leppo

One month later over Labor Day weekend, I was relieved to find that a beautiful adult female fly poison borer had emerged. It was a rewarding experience to find success with this relatively simple and easy method for locating one of Pennsylvania's very unique and secretive moths.

Limestone Habitats: A Rich Niche for Plants

by

Jessica McPherson

Venture onto certain slopes of central Pennsylvania in late summer, and you will find some of the botanical treasures of the state's rare limestone grasslands in full display. In late August and early September, the purple heads of blazing star and the showy yellow panicles of stiff goldenrod are in bloom, and the graceful seed stalks of sideoats grama grass hang in their tidy lines. In springtime, slopes enriched by limestone can be spotted from afar by the bright pink sprays of redbud shrubs in bloom and the golden flowers of round-leaf ragwort carpeting the forest floor, both in full display before much else leafs out. Upon closer inspection, one will likely find a treasure trove of spring wildflowers, and just perhaps, something more unusual like the ebony sedge, with its fine leaves and tiny black seeds hanging down over a cliff face, or the dainty round leaves of the globally rare Appalachian endemic Canby's mountain lover creeping over low limey rocks.

Jessica McPherson

Stiff goldenrod (*Oligoneuron rigidum*)

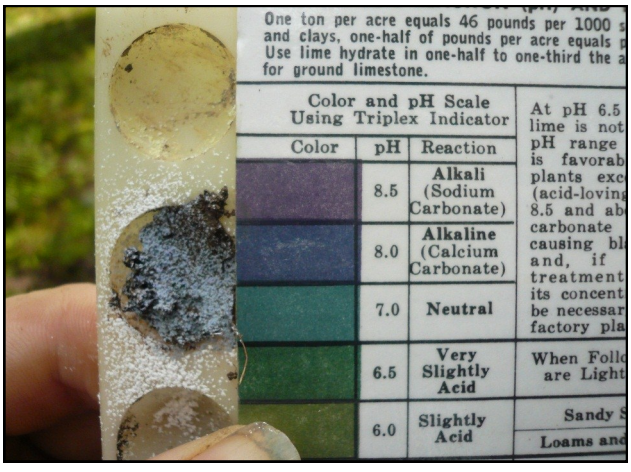
Calcareous habitats like these have long been favorite haunts of plant lovers, both for their overall diversity and for the chance to see unusual species. There is also a general sense that these habitats are relatively uncommon in Pennsylvania, and perhaps under threat; many of the examples people are familiar with are small fragments, or invaded by exotic species. We recently undertook a study of the flora and natural communities of calcareous habitats in Pennsylvania, with the aims of figuring out just how much of our vascular plant diversity depends on calcareous habitats, how much is left in the state, and what the conservation needs are for these ecosystems.

Jessica McPherson

Redbud, blooming here above the Youghiogheny River in early spring, is a small native tree found in limestone forests and woodlands.

Why are calcareous habitats significant to plants? Calcareous habitats are places where the growing substrate for plants, either soil or rock, is enriched by high levels of calcium, usually from limestone or other calcareous rocks. Calcium enrichment raises the pH of soil. But why are the redbud and the golden ragwort only found in calcareous areas?

Plants grow roughly in the pH range of 3.5 – 9.0, and the availability of soil nutrients is highly dependent on soil pH. In the range between pH 5.5 and pH 6.5, most nutrients are available. Below 5.5, metals (iron, manganese, zinc, copper, aluminum) become soluble to the point of potential toxicity, while nitrogen, potassium, and phosphorus become less available. Above 6.5, the metals become immobilized, and above



Jessica McPherson

Soil pH test kit displays blue-purple color indicating alkaline soil.

7.0, phosphorus availability is very low. Plants that specialize in one portion of the pH scale appear to have mechanisms to compensate for the nutrient limitations in that range. For example, blueberries that thrive in acid environments can tolerate high levels of metal, but can't acquire adequate phosphorus in high pH environments. Some species of high pH habitats secrete acids from their roots to help acquire phosphorus. Competition may also play a role; several studies have documented that some species are only observed on calcareous substrates in nature, but can grow or even thrive in non-calcareous soils if competition from other plants is removed.

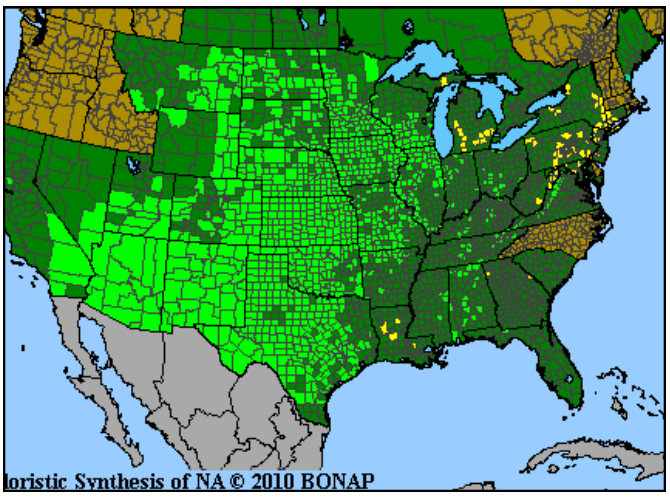
Jessica McPherson

Sideoats grama grass (*Bouteloua curtipendula*) in bloom; red anthers dangle below the flowers.

So how much of Pennsylvania's overall plant diversity is made up of specialists? To answer this question, a panel of expert botanists rated the entire vascular flora of Pennsylvania according to the pH of its preferred habitat, using three categories: low, midrange, and high pH. We found that 30% of all native vascular plants known to currently inhabit Pennsylvania use calcareous (high pH) habitat, 33% use acidic (low pH) habitat, and 59% use midrange habitat. A quarter of the flora are habitat specialists that live mainly or exclusively in extreme pH environments; 10% (197 taxa) are calciphiles and 15% (301 taxa) are acidophiles.

Both categories of habitat specialists figure prominently on Pennsylvania's list of rare, threatened, and endangered plants; 24% of these special-concern taxa are calciphiles and 20% are acidophiles. Proportionally, however, more of the calciphiles are rare (57%) than the acidophiles (33%).

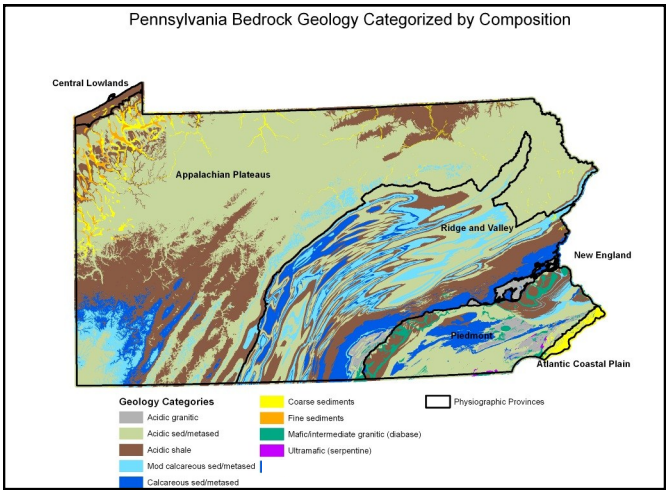
Patterns in the global distribution of our calciphile species may help to explain why many of them are rare, and these patterns also contribute to our understanding of their conservation value. Many of the species of limestone grasslands, like the sideoats grama or stiff goldenrod, are predominantly found in the Midwest and the Pennsylvania locations are part of a smaller, disjunct eastern population. Almost a third of the calciphile taxa



North American range map for sideoats grama grass; dark green indicates presence in state, yellow counties indicate rare in state.

have northern distributions, with the Pennsylvania populations near the southern edge of their range. Another group of calciphiles are southern species whose Pennsylvania populations are near the northern edge of the range; this includes six taxa of global concern. These species may be naturally rare because they are near the edge of their range.

Habitat loss has almost certainly contributed to the rarity of our calciphile taxa as well. The vast majority of Pennsylvania's surface geology is sedimentary acidic rock layers such as sandstone and shale. Only 8% of Pennsylvania has calcareous surface geology, where the calciphile plants could potentially live; most of this area falls in the Ridge and Valley physiographic province, and there are also significant calcareous areas in the southwest and in the Piedmont portion of the southeast. However, the amount of usable habitat has



Dark blue indicates calcareous surface geology; light blue indicates moderately calcareous surface geology.

Jessica McPherson

The mesic limestone prairie at Big Hollow, Centre County.

been greatly reduced by development; only 17% of land over calcareous bedrock remains forested. In the state as a whole, 60% remains forested. Most of Pennsylvania's land with calcareous bedrock occurs in the valleys of the Ridge and Valley or Piedmont physiographic provinces, which have been heavily developed for agriculture and residential or urban use. About a third of Pennsylvania's limestone bedrock area is in the southwestern portion of the state, more rolling terrain that has not been so heavily developed; this region now has half the calcareous habitat that remains in natural condition.

Calcareous habitats face a number of other threats, as well, including habitat fragmentation, invasive species, and climate change. The remaining areas of calcareous habitat are extremely fragmented; only 3% of calcareous forest is in blocks of 1000 acres or larger and 59% is in blocks 100 acres or smaller. (In the state as a whole, 43% of forest cover occurs in blocks 1000 acres or larger and just 15% is in blocks of 100 acres or less). Small fragments face grave threats to their long-term viability; pollinators or dispersal agents might be absent, and small populations can be lost to chance events with no opportunity for replenishment. Connection with surrounding natural landscape enhances long-term viability, and is especially important now, as climate change may require species to disperse to new locations in order to find suitable habitat.

Jessica McPherson

A mesic limestone outcrop with two calciphile ferns; slender cliffbrake (*Cryptograma stelleri*) and maidenhair spleenwort (*Asplenium trichomanes*)

Despite the fragile status of existing calcareous habitats and their importance to biodiversity, less than 1% of Pennsylvania's protected lands are on calcareous geology. In order for the purple heads of the blazing star, as well as the other stars among our suite of calciphile taxa, to be around for future generations to appreciate, we will have to make progress in managing for invasive species, maintaining community structure through techniques like controlled burning, and connecting these unique habitats to larger pieces of protected lands.

Jessica McPherson

Northern blazing-star (*Liatris scariosa*), Big Hollow mesic prairie

Notes from the Field

Beaver County Inventory Update

In 1993, the Beaver County Natural Heritage Inventory identified 34 Natural Heritage Areas. An update to the CNHI has been in progress to see how conditions on the ground have changed at those sites, to check up on populations of rare species, and to visit new areas with potential to be Natural Heritage Areas. Surveys for this update have progressed toward completion over the summer.

One of the target plants was the globally rare rock skullcap (*Scutellaria saxatilis*). This species grows in moist forests, and is known from a site on the bluffs above the Ohio River. We did not locate the plant where it had been found before. It may be that the development of malls above the bluffs, with expanses of impermeable pavement, has made the bluffs drier by reducing the proportion of rainwater that seeps into the ground. On the positive side, we were pleased to find that the bluffs harbored a huge population of pipevine swallowtail butterflies (*Battus philenor*).

Pete Woods

Featherbells

In Raccoon Creek State Park, park staff reported finding a patch of featherbells (*Stenanthium gramineum),* which was then documented by PNHP staff. This was the first confirmed sighting of the plant in Beaver County in many decades.

The dragonflies and damselflies of Beaver County have not been well-documented, and surveys of these insects have turned up some noteworthy finds. One target species is the royal river cruiser (*Macromia taeniolata*), a large dragonfly first documented in Pennsylvania several years ago. We suspected they could be present along the Ohio or Beaver rivers, so PNHP staff, along with volunteer Ben Coulter, visited a stretch of riffles along the Beaver River on the border between Beaver and Lawrence counties. We quickly found arrow clubtails (*Stylurus spiniceps*), a common species not previously known from either county, and then netted several russet-tipped clubtails (*Stylurus plagiatus*), never before found in western Pennsylvania. Ben was convinced he was seeing additional dragonflies over the river, and returned evening after evening. His persistence paid off when he captured a globally rare species which had not been seen in Pennsylvania since 1921, the elusive clubtail (*Stylurus notatus*). Ben returned once more with a friend who finally netted our initial target, a royal river cruiser.

Pete Woods

Russet-tipped clubtail, male

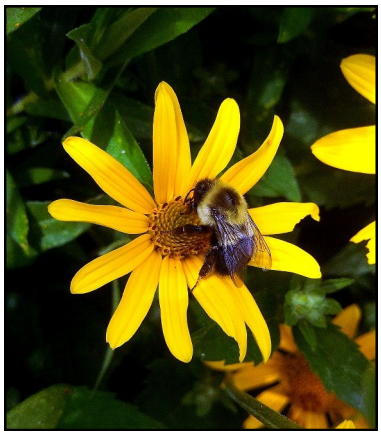
Another rarely-seen resident of Beaver County is the Monongahela blue crayfish (*Cambarus monongalensis*). This electric blue crayfish doesn't live in streams, but instead digs burrows in seeps and other areas where the water table is close to the surface. Our surveys this summer uncovered three new populations of this species.

Pete Woods

Monongahela blue crayfish

Surveys for the Beaver County Natural Heritage Inventory will conclude this fall, and new site descriptions will be written over the winter.

Pennsylvania Pollinator Conservation Planning

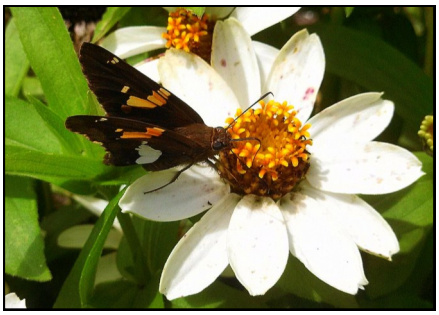

David Yeany

Common eastern bumble bee

PNHP staff recently attended a conservation planning workshop at Penn State University sponsored by the Xerces Society for Invertebrate Conservation that centered on the conservation of pollinating insects – bees, butterflies and moths, beetles, flies, and wasps. Pollinators provide an essential ecological service for the reproduction of more than 85% of flowering plants worldwide. Our natural ecosystems and farms rely on the vital work of these pollinators for production of fruits, seeds, and crops. The workshop touched on all of these pollinating insect groups, but really focused on the plight of our native bees – of which there are more than 400 species in Pennsylvania.

About 25 years ago, bee biologists started to notice a decline in the abundance and distribution of several wild bee species. Five of these species were once very common and important pollinators over their ranges. Habitat loss, pesticide use, management practices, and pathogens have led to steep population declines. There are two globally imperiled bumble bees which occur in Pennsylvania: the rusty patched bumble bee (*Bombus affinis*) (G1) and the yellowbanded bumble bee (*Bombus terricola*) (G2G4). Reporting observations of these species is one way to help with their conservation. Pocket ID guides were provided at the workshop and are available online: http://www.xerces.org/wp-content/uploads/2009/02/affinis_pocketid.pdf and http://www.xerces.org/wp-content/uploads/2009/02/terricola_pocketid1.pdf.

After learning about threats facing native bees and their current status, workshop participants were given instructions on assessing, identifying, and creating high quality pollinator habitat, as well as how to make habitat management recommendations for native pollinators. We learned basic bee identification and how to apply two new habitat assessment and installation guides in the field portion of the workshop. We were also given another new resource for pollinator conservation, *Attracting Native Pollinators: Protecting North America's Bees and Butterflies.* This Xerces Society publication is a guide to pollinator ecology, planning for pollinator conservation in a variety of habitats from farms to urban gardens to natural areas, and regional plant lists for establishing or enhancing native pollinator habitat. You can find these resources for pollinator conservation and much more online at http://www.xerces.org/pollinator-resource-center/.


David Yeany

Silver-spotted skipper

Northern Riffleshell Discovery


Alysha Trexler

Northern riffleshell mussel

The Marcellus Shale impact project has given the WPC Heritage and Watershed Conservation staff the opportunity to team up on some great monitoring surveys. In late August, Ryan Miller from the Heritage program met with Alysha Trexler and Danielle Plaisted from the Watershed Conservation program for a queen snake survey on Sandy Creek near Polk in Venango County. While walking the stream bank, a large amount of freshwater mussel shells were noted by the biologists. After the snake survey they began to collect some shells to get a generic species list for the stream. Within an hour, eight mussel species were documented with dead shells, including the federally endangered northern riffleshell (*Epioblasma torulosa rangiana*) and three other tracked species.

The northern riffleshell is imperiled throughout its range; the surviving Pennsylvania populations (in the upper and middle Allegheny River Watershed) are some of the best remaining in the world. Water

pollution, dam construction, and dredging are the major causes for its decline, but other threats include stream sedimentation, channelization, and reduced host fish populations. The riffleshell escaped detection in Sandy Creek when biologists performed mussel surveys in 1919, the 1960s, and 2007.

Alysha Trexler

Watershed Conservation, Natural Heritage, and Pennsylvania Fish and Boat Commission staff conducting a mussel survey.

A week later, we assembled a team of five biologists from WPC and the Pennsylvania Fish and Boat Commission to carry out a more thorough snorkel survey of the creek. During that survey, four live riffleshell and nine other species of mussel were discovered within a 100 meter stretch of the creek. Another site a few miles upstream yielded another federally endangered mussel species, the clubshell (*Pleurobema clava*). This species was detected in surveys from the early 1900s and 1960s and was now re-documented with the presence of dead shells. With these discoveries, we conclude that Sandy Creek may hold an ecologically significant mussel population. More follow-up mussel surveys will be conducted next year.

Status of Great-spurred Violet on Public Lands

In early spring, we conducted population and habitat assessments for great-spurred violet (*V. selkirkii*) in north central Pennsylvania. The goal of this WRCP-funded project was to update population information for great-spurred violet on public lands, and to use data from habitat assessments to improve conservation planning for this species. Overall, great-spurred violet populations appear to be secure on public lands (state game lands and state forests). Populations were more extensive than expected, with five populations having over 1,000 plants. Most importantly, forested habitats were undisturbed, and in nearly all sites, invasive plant species were rarely encountered.

Adam Hnatkovich

Great-spurred violet

We were also interested in habitat preferences of great-spurred violet and in the extent of viable habitat in state forests and state game lands. We hypothesized that great-spurred violet prefers rich northern hardwood forests, where species like sugar maple, basswood, and green ash account for significant portions of the forest community. We conducted habitat assessments in forest stands that supported great-spurred violet and in adjacent stands where great-spurred violet was not documented. Species richness was significantly higher in violet stands than in adjacent stands. However, violet stands were not significantly different from adjacent stands with regard to forest composition (i.e., relative cover of dominant tree species). In both stands, sugar maple was the dominant forest species, with ash, basswood, cherry, and hemlock varying in their relative cover among sites. Interestingly, in both stand types, ash and basswood accounted for a combined 25-30% of the forest canopy. This could suggest that rich hardwood forests are more extensive than expected, and/or that great-spurred violet is unable to colonize adjacent stands as a result of short-seed dispersal distances (ballistic and ant-dispersed). It is also possible that, within rich hardwood stands, there

Adam Hnatkovich

A northern hardwood forest in early spring, Susquehannock State Forest

are other environmental features that explain the distribution of great-spurred violet. In future studies of these populations, we will more closely examine soil chemistry, and ant diversity or colony distribution.

As a result of this study, conservation planning polygons for great-spurred violet have been expanded to include occupied and available habitat. In the near future, we will revisit management recommendations for great-spurred violet on state game lands. Based on current conditions on game lands, population size, and this species' current status across the entire northern tier, great-spurred violet may require little management attention. In 2014, we intend to continue our work in northern hardwood forests. By sampling a larger number of northern hardwood forests, we can improve our understanding of the variation in forest composition across the northern tier, and characterize this variation as we update our terrestrial community types.

Vernal Pools Website

Betsy Leppo

The Vernal Pools of Pennsylvania website has a new home with the Pennsylvania Natural Heritage Program. The site has pictures and information on a wide range of topics related to vernal pool habitats and conservation. Educational documents are available for download on vernal pool identification, wetland restoration, best management practices for landowners, and registering a pool in the Pennsylvania vernal pool database. http://www.naturalheritage.state.pa.us/VernalPools.aspx

Informing Trail Planning through NHAs

One of the main uses of PNHP's Natural Heritage Areas dataset is to inform planning and decision making. The more than 3,700 sites in this database are used to provide information and insights for a variety of development and conservation projects. One these projects using NHA data from the Erie County Natural Heritage Inventory update is the development of a trail master plan update for the Penn State Behrend Campus in Erie, Pennsylvania.

Mike Kotyk

Heritage staff explore conservation needs within the Wintergreen Gorge NHA with Pashek Associates and Penn State Behrend staff.

Pashek Associates, based in Pittsburgh, is the landscape architect retained by Penn State Behrend to complete this project. As part of the ongoing work, Pashek asked PNHP to conduct a field view with them to discuss the following: how the trail system can be improved to ensure the existing and proposed trail network does not negatively impact sensitive species and their habitats; the dynamics associated with the Lake Erie bluffs and bluff seeps; and potential boundaries for conservation of sensitive habitats.

On a cool and crisp September day, PNHP staff visited the site along Wintergreen Gorge with Pashek and members of the advisory committee. One of the main issues noted was compaction and erosion of soils along the sensitive river bluff seeps and forests, both rare natural communities in Pennsylvania. We also looked at a number of wetland, forest, and habitat issues on the site.

"Getting assistance from PNHP is a great help to us in developing a master plan. With the knowledge gained during the field view with PNHP staff we will be able to ensure that the proposed Wintergreen Gorge trail improvements are sustainable, that they are integrated with the rich resources of the Wintergreen Gorge, and that they will respect the sensitive environments they pass, preserving this ecologically rich gorge for future generations to enjoy," said John Buerkle, a principal at Pashek Associates. Findings from our visit in regard to sensitive areas of the site will be integrated into the trail plan.

PNHP staff are available to answer questions and concerns regarding Natural Heritage Areas and share recently developed NHA reports. Please contact Christopher Tracey at 412-596-2326 or ctracey@paconserve.org).

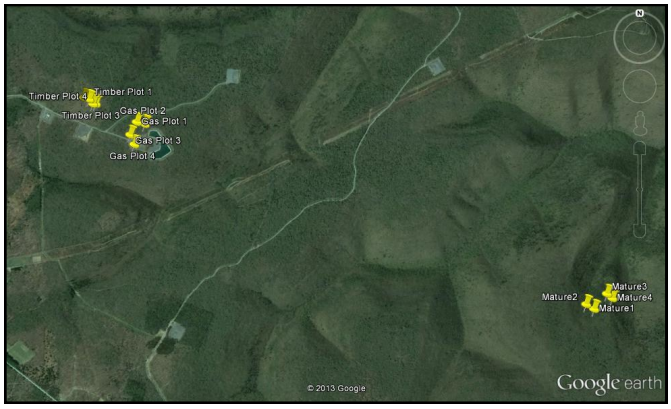
Bryophtyte and Lichen Indicators

A project investigating the Tiadaghton State Forest for potential bryophyte and lichen indicators of forest integrity (i.e., species composition, ecological structure, temporal and spatial characteristics, and disturbance regimes of similar undisturbed forest ecosystems) began in earnest over the summer. Scott Schuette with PNHP, and James Lendemer, Lichenologist with the New York Botanical Garden, sampled research plots that were established in the area of Miller Run Natural Area in mid-May of this year.

Scott Schuette

Contrary to popular belief, mature stands of dry oak heath forest provide good habitat for bryophytes and lichens in north central Pennsylvania. This site in Miller Run Natural Area hosts greater species diversity than forests that have been impacted by current timbering practices and energy infrastructure development.

There are four plots adjacent to a well pad, four plots in a recent timber sale, and four plots in Miller Run Natural Area. All species of bryophytes and lichens were collected from all substrates within the plots and identified to determine the overall species diversity at each site. In addition to the species data, environmental variables were collected and analyzed for any gross differences among the plots.



Aerial view of research plot locations in the Tiadaghton State Forest, Lycoming County

Scott Schuette

The liverwort *Ptilidium pulcherrimum* with sporophytes

We collected a total of 68 species of bryophytes and 114 species of lichens from the plots. Species diversity for both bryophytes and lichens was greatest in the mature plots from Miller Run Natural area with 53 and 82 respectively, while there were only an average of 34 bryophyte and 57 lichen species from the other two sites. The mature plots also harbor at least 5 species of bryophytes and 11 species of lichen rare to Pennsylvania. So we can say that the species diversity from the mature plots is qualitatively better than that of the other plots. The environmental variables indicate that the mature plots are cooler, moister, and shadier. These characteristics are closer to ideal for bryophytes and to some extent lichens.

These preliminary data suggest that there may be some environmental drivers to the differences in species diversity. More quantitative analyses are being conducted to answer that question. In addition to determining the relationship between environment and species diversity, indicator species analyses are being conducted to identify any species or suites of species indicative of mature forests with good integrity.

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 (2013)	1st Quarter	2nd Quarter	3rd Quarter	Cumulative Total	Percent of Annual Goal
Biotics Records Updated	200	60	105	125	290	100+%
New EOs Documented	800	147	295	106	548	69%
New Records Entered into HGIS	300	71	129	76	276	92%
Field Surveys Reported	500	0	122	173	295	59%
New CPPs Developed	4000	894	1205	1426	3525	88%
NHAs Updated	120	0	107	3	110	92%
Outreach to Local Government	20	0	2	4	6	30%

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 Performed 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.