

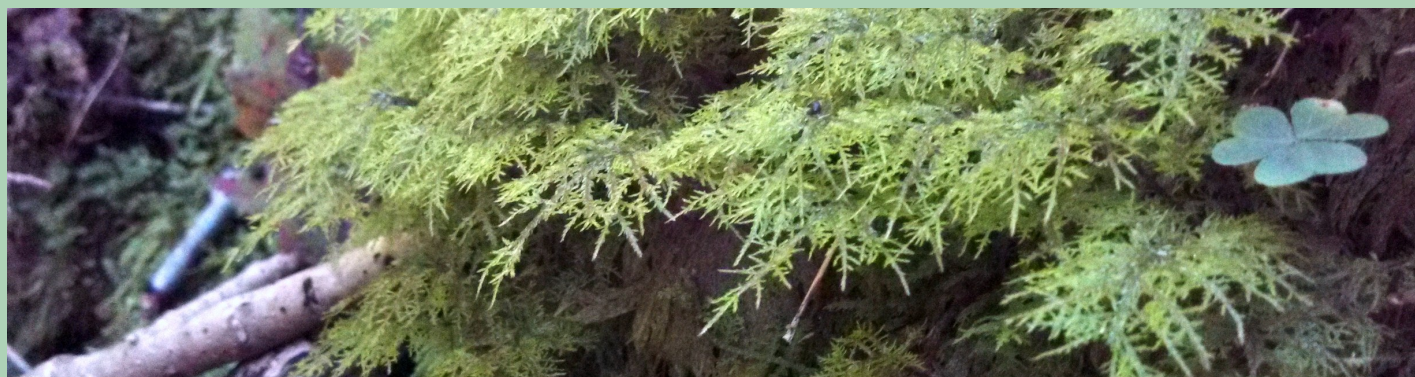


Pennsylvania Natural Heritage Program

information for the conservation of biodiversity

Wild Heritage News

January—March 2014



Bryophytes and Lichens of Dry Oak Heath Forest Communities

by

Scott Schuette

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Photo Banner: Scott Schuette

The stair-step moss (*Hylocomium splendens*) is an uncommon species in Pennsylvania that truly lives up to its name. It blankets the forest floor, boulders, and fallen trees. This splendid moss is indicative of cool, moist coniferous and hardwood forests of good quality.

Pennsylvania is flush with a diversity of forest communities, some garnering special attention due to the quality of plant diversity and others for the hardwood resources they provide. The dry oak heath forests fall into the latter category. These forest communities are found throughout the state occurring on moderately dry to xeric, acidic sites that usually have shallow or sometimes sandy soils. The dominant tree canopy is chestnut oak (*Quercus montana*) mixed with black oak (*Quercus velutina*), white oak (*Quercus alba*), and red maple (*Acer rubrum*). Other tree species that are commonly present in the subcanopy include sassafras (*Sassafras albidum*), sweet birch (*Betula lenta*), black gum (*Nyssa sylvatica*), and eastern white pine (*Pinus strobus*). The shrub layer is dominated by the state flower, mountain laurel (*Kalmia latifolia*), and various blueberry (*Vaccinium* sp.) species. The herbaceous layer is quite sparse due the stressful conditions and decay resistant leaf litter. Dry oak heath communities are of little botanical interest because of the similarity of species present across its distribution. However, there is

biodiversity ripe for exploration if one just looks a little bit closer at the smaller organisms living within this forest community.

Bryophytes and lichens are present in every forest community, regardless of size and condition. It is well-documented that bryophytes and lichens are sensitive to human disturbance and, as a result, have been used as indicators of habitat quality. These organisms tend to live on the trees and shrubs as epiphytes (rootless, independent living plants), but they can also completely cover boulders or reside



Human activities in the forest create disturbed areas that are colonized by pioneer species of bryophytes and lichens. The pincushion moss (*Leucobryum glaucum*) looks like tiny pine seedlings on this disturbed soil along forest edge.

Scott Schuette

in shady damp crevices where rocks, roots, and soil intermingle. Since bryophytes and lichens use an abundance and variety of microhabitats in a forest, they may provide useful ecological information about larger scale processes in a forest community undergoing frequent multiple disturbances. Research into the feasibility of using bryophytes and lichens as indicators of changes in the forest ecosystem has only recently begun in earnest.

In the spring of 2013, PNHP staff initiated a Wild Resources Conservation Program-funded project in the dry oak heath forests of Tiadaghton State Forest in western Lycoming County. This area is a hotbed of human disturbances, including timber sales and natural gas development. As a result the forest is in various stages of succession and provides an excellent opportunity to investigate the impacts of these disturbances on bryophyte and lichen diversity, as well as on the dry oak heath community overall. The project asks the question of whether there are species of bryophytes and/or lichens indicative of good forest integrity, which is briefly defined as a conservation endpoint that integrates natural biodiversity, stand structure, and continuity. The process of answering this question involved identifying forest blocks that have been subjected to disturbances related to natural gas development and timber sale activities, as well as forest



An aerial image of the study area showing Miller Run Natural Area (shaded polygon) relative to energy development pressures.

blocks that were free of anthropogenic disturbance. Once the blocks were identified, four 400m² plots were established in each of three disturbance regimes; adjacent to a gas well pad, within a recent timber sale, and within a mature natural area. From these plots we collected and identified all species of bryophytes and lichens from all substrates. Environmental variables including temperature, relative humidity, light intensity, and soil pH and moisture were recorded along with vascular plant diversity and relative abundance.

The Usual Suspects

Bryophytes and lichens are very common organisms to find in our forests, but some species are much more common than others making them marginally useful for determining forest quality and integrity. *Parmelia* sp. is a lichen found on nearly every tree in the



Parmelia sp.

<http://commons.wikimedia.org>



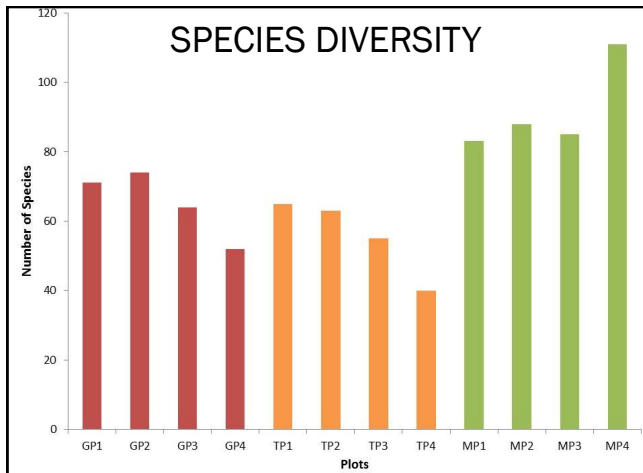
Bazzania trilobata



Ceratodon purpureus

Scott Schuette

forest. It looks like the tree has splotches of whitish gray when dry, and grayish green when wet. It is found more frequently in younger growth disturbed stands than in the more mature undisturbed stands and may be useful in determining the disturbance level of the forest. *Bazzania trilobata*, one of the most common liverworts in Pennsylvania, grows primarily on medium to large boulders on the forest floor. It is occasionally found on exposed tree roots along stream cuts. These types of substrates are more prevalent in mature forest stands. However even mature forests can be of marginal quality and integrity if they are heavily impacted by human recreation activities. Purple moss (*Ceratodon purpureus*) is abundant in disturbed soils along forest edges, roadsides, ditches, etc. This disturbance-reliant, prolific moss is one of the first species to colonize newly available soil substrates until other plant species move in to the habitat. At the study site, purple moss was found only along the forest edges where soils had been exposed from vehicle traffic.



There were a total of 177 species collected from the 12 plots at the study site. This graph shows the diversity by plot. There is clearly more diversity in the each of the mature plots (green bars) than in the disturbed plots.

Species were collected from 30 different types of microhabitats. More than half of the collections were from bark or bases of tree species in the plots, while a small fraction of the collections were from rock and various classes of forest floor debris. This effort yielded 66 species of bryophytes and 111 species of lichens from the 12 plots. The greatest diversity (136 species) was found in the mature natural area plots from Miller Run Natural Area and the least diversity (85 species) occurred in the timber sale plots. The well pad plots had an intermediate diversity (107 species) as compared to the other two plot types. Much of this diversity is driven by substrate availability and the associated microclimatic conditions in the forest habitat. While these total numbers of species may not be statistically different, qualitatively they are very different, especially when considering rarity. There are at least 11 lichen species and 5 bryophyte species that are Pennsylvania rare. On

a broader landscape scale, three lichen species are rare in the Central Appalachians and one is rare throughout the Appalachian range. All of these rare species with a couple of exceptions were found exclusively in the mature plots of Miller Run Natural Area.

In addition to the species data, preliminary environmental data suggest that temperature, humidity, and light intensity may be driving the species differences between the sites. It is known that these three variables are correlated—higher temperatures are related to increased light intensity and a decrease in relative humidity. Mature plots on average have lower temperatures, higher humidity, and lower light intensity than plots from the other sites. These conditions are ideal for bryophytes because their function and growth are directly controlled by ambient humidity. Likewise ideal conditions are found more frequently in old growth or mature forest stands of large block size than in second or third growth fragmented forests. The older trees in mature forest blocks allow more time for bryophyte colonization and persistence.

It is hopeful that there may be a suite of species indicative of forest integrity in Tiadaghton State Forest given that there is greater species diversity as well as a greater number of uncommon species in the natural area than in the timber sale and well pad sites. A second field season is planned to collect some additional environmental data along with abundance values of species on specific substrates from the different sites. These data will be included in comprehensive analyses to determine specific environmental drivers as well as indicator species for mature and disturbed dry oak heath forests. A final report will be submitted to WRCP in December 2014.



Miller Run Natural Area in Tiadaghton State Forest, Lycoming County is a good example of mature second growth dry oak heath forest with a canopy dominated by chestnut oak (*Quercus montana*) and red maple (*Acer rubrum*) with mountain laurel (*Kalmia latifolia*) making up the subcanopy.

Life at the Edge, of Range...

by

Christopher Tracey

Pennsylvania is at an ecological crossroads due to its geographic position as well as its geological and climatic history. Much of the current native flora of Pennsylvania results from plant migrations northward after the last glacial retreat. Many rare, threatened, and endangered plant species, as well as some common native plant species in the state, are at or near the edges of their distributional ranges. That is, the northern portion of the state has many species that are at the southern edge of their range and the southern portion of the state has species that are at the northern edge of their range.

Edge occurrences of species are broadly referred to in ecological literature as peripheral populations.

Peripheral populations can be

- 1) edge-of-range—species that occur at the borders of their distribution;
- 2) disjunct—populations that are far separated from the heart of the species range; or
- 3) regional endemics—species that are restricted to a narrow area where all of its distribution can be considered range edge.

PNHP staff have recently started a Wild Resource Conservation Program funded project to examine the ecological and conservation needs of peripheral populations in Pennsylvania. We've recently completed the first stage of this project by developing a list of Pennsylvania's peripheral plant species. Using our Heritage database and several other information sources, we determined that of the nearly 700 plant species that are tracked by PNHP, approximately two-thirds of them can be classified as peripheral meeting one of the definitions above. Although, we have not investigated all of the 2,200 known native plant species in Pennsylvania, a portion of the more common species (e.g., non-tracked in the PNDI database) would likely meet the peripheral criteria as well.

The following are some examples of the peripheral plant species in the state.

Northern Affinities

Creeping Snowberry (*Gaultheria hispidula*)

Its original range spread from far northern Canada to as far south as North Carolina, but it has been extirpated from the southerly portions of its original range. In



Creeping snowberry

Pete Woods

Pennsylvania, creeping snowberry is confined to the cooler northern tier, limited to isolated, high elevation wetlands where it represents the southern edge of its current range.

Creeping in from the Southwest Snow Trillium (*Trillium nivale*)

The diminutive snow trillium, one of our earliest flowering plant species, is an herbaceous, long-lived, woodland, perennial wildflower. Its range is centered in the Midwestern states, with western Pennsylvania being at the eastern limits of its range. It typically occurs on limestone crevices, limestone talus slopes, and the bare, sliding soils on the top of limestone cliffs.



Snow trillium

Pete Woods

Scattered and Disjunct

Box Huckleberry (*Gaylussacia brachycera*)

A relict species nearly exterminated by the last ice age, box huckleberry is found in isolated colonies which reproduce clonally by underground creeping stems, known as rhizomes. Of the two populations in Pennsylvania, one of the colonies is estimated to be about 8,000 years old, which would make it the oldest woody plant east of the Rocky Mountains; the other colony is about 1,300 years old, and has been protected by the Box Huckleberry Natural Area. Most of the reported occurrences for box huckleberry fall within the Appalachian Mountains, ranging from central Pennsylvania to eastern Tennessee. Its scattered distribution suggests that the species was once spread more broadly across North America, but was almost eradicated by glacial advances, surviving only where it escaped the ice in protected refugia.



Box huckleberry in fruit

A Potential Regional Endemic

White Monkshood (*Aconitum reclinatum*)

White monkshood grows in moist areas along streams, in coves, or in seeps within mixed forests at higher elevations. It barely reaches into Fayette County, at the northern limit of its range, but it ranges south through the Appalachians to North Carolina. While quite rare throughout most of its range, the largest known populations are in North Carolina.

Ecologists and conservation biologists generally agree that there are several good reasons for the conservation of populations of peripheral plant species. One of the main principles is that populations at the geographic margins of their ranges may be important for the long-term survival of species, as they can be major contributors to evolutionary change and may

have a unique genetic make-up. Additionally, some species at risk at the edge of their range are also at risk over a large portion of their range, therefore marginal populations are equally important conservation targets as populations more in the center of the species range.

Populations at the edges of geographic ranges may also be important in surviving long-term environmental changes, such as global warming as they may be better positioned to migrate north or south (or up and down) in response to temperature and moisture changes.

PNHP is currently conducting an assessment of the different types of habitats and natural communities occupied by edge-of-range plant species, conducting modeling and looking at available habitat for these species. Understanding this relationship will help agencies and conservation organizations prioritize land and water conservation targets and exert effort where it will prove most fruitful. Whether the populations of these species are likely to grow or decline in the future is an important management consideration and one that can help determine the status and level of responsibility that Pennsylvania should assume.



White monkshood

Steve Grund

www.wikipedia.org

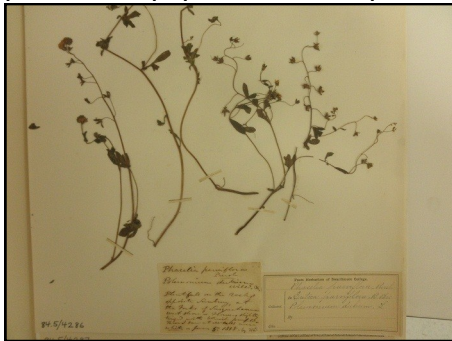
Preserving the Records of our Work

by

John Kunsman

In May of 2011, while driving north on U.S. 11 across the river from Sunbury and just south of the confluence of the two branches of the Susquehanna, I stopped briefly to observe numerous colonies of scorpionweed (*Phacelia dubia*), a PNHP Watch species, which were blooming on the open shale slopes. Last winter, while sorting through specimens at the State Museum, I was very pleasantly surprised to find a specimen of scorpionweed with the following hand-written label information: "plentiful on the rocks opposite Sunbury, at the forks of Susquehanna, west shore ... June 5, 1818...by WD" [probably William Darlington, a Chester County botanist]. In other words, this species is growing today precisely where it was growing nearly 200 years ago. Besides learning something about how persistent a population of scorpionweed can be, I was

reminded again of the importance of maintaining a collection of archival plant specimens, which allow botanists to take a peek into the past.



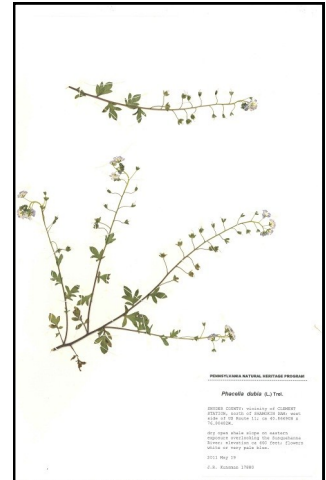
Scorpionweed specimen, 1818

Before my first herbarium visit over 40 years ago, I assumed that dried plants would simply turn to dust after a number of years; instead, the opposite is true. Once thoroughly dried, plant material is generally immune to the bacteria, fungi, and other agents of decay that would break it down and recycle it in a natural setting. But there is no free lunch after drying, as specimens still have threats, such as improper mounting and handling, fire, excessive heat and humidity, and especially certain species of insects. Of the latter, a particularly destructive one is the cigarette beetle or herbarium beetle (*Lasioderma serricorne*). This 2 to 3 mm long beetle, and particularly its fuzzy caterpillar-like larva, feed on dried plants, especially the softer and apparently more appetizing parts like



Herbarium beetle

flowers, fruits, and leaves. If not detected in time – and some larvae seem to have an innate talent at hiding under leaves or within a flower – an entire specimen, or at least its most important parts, can be completely ruined. Constant vigilance is required, since these little rascals seem to be ubiquitous and sooner or later will show up at a collection and begin feasting.



Scorpionweed specimen, 2011

Botanists have been battling these pests for centuries. Early on, plant specimens were treated with poisonous solutions of arsenic or mercury, which may have been effective against insects but often reduced the quality of the plant specimen and provided a health hazard to people working with the specimens. Prevention methods then changed to the use of chemical fumigants – probably the best known of which was naphthalene, the primary ingredient in “mothballs” – to protect the specimens from infestation. This control agent had the advantage of not impacting the plant specimens, but did no immediate favors for the noses of herbarium workers and endangered their long term health. In recent years, protection of specimens has been moving away from reliance on chemicals and has utilized refrigeration. In this method, plant specimens are placed periodically in a freezer at very low temperatures for a period of time, typically a few days to a couple of weeks, before being deposited back in the airtight herbarium cabinets in which they are stored. The cold, dry environment of the freezer doesn't harm the specimens, and the only unhealthy consequence is reserved for the insects that might be present.

With a few precautions, the nearly 200 year old scorpionweed specimen at the State Museum should be around for its 300th anniversary in the year 2118, and future botanists can study it and the multitudes of other specimens that have been handed down to them by previous generations of botanists.

John Kunsman

John Kunsman

Clemson University
USDA Cooperative Ext

Notes from the Field

PNHP Banded Bat Found in New York State

In 2006, Pennsylvania Game Commission (PGC) biologists radio-tracked a female Indiana bat from an abandoned coal mine in Luzerne County, using aircraft and a highly coordinated team of ground crews. Over the course of a few nights, the bat traveled south for 55 miles, eventually establishing her summering territory in Berks County. Later that summer, concentrated mist netting efforts in this area yielded three Indiana bat captures, two of which were affixed with radio transmitters to determine the preferred foraging areas and identify the day roosts. Since then, little effort had been spent monitoring the bats in this area to see how the bat population was doing since the massive die-offs from white-nose syndrome (WNS).



Charlie Eichelberger

The federally endangered Indiana bat is noted for its short muzzle and slightly purplish hue. This Indiana bat, captured before the onset of WNS, has a numbered yellow plastic band that is secured to the bat's forearm.

In 2013, PNHP biologists assisted the PGC with survey efforts in this important Berks County summering habitat. Over four nights of mist netting in June, we captured and banded six Indiana bats, including a juvenile female that was banded by PNHP Assistant Zoologist, Joe Wisgo. In March 2014 New York Department of Environmental Conservation biologists found this juvenile female while she was hibernating in a mine in Ulster County, New York (130 miles north of the summering habitat).

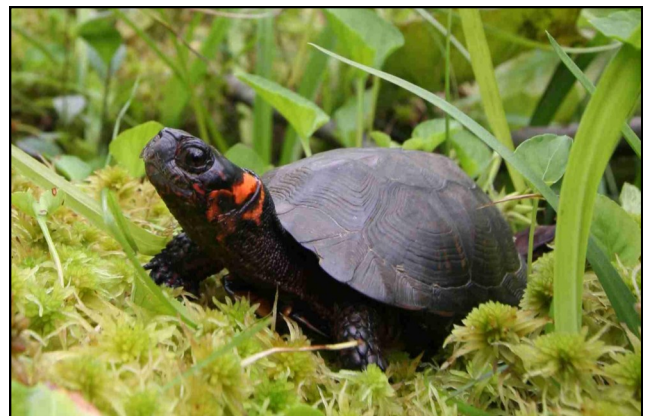
We had assumed that on the slim chance the bat would be captured again, we would find her either during egress/ingress surveys at the Luzerne County mine or back at her summering habitat in Berks County. Only

every few years do we hear of bats that were banded being positively identified in caves... and this one is an Indiana bat! What a find! Not only are we glad to see that this juvenile survived the winter in the midst of WNS, but knowing that the Berks County summering habitat is used by at least two wintering bat populations shows the importance of this area to the regional recovery of this endangered species.

Keeping Track of the Bog Turtle

The bog turtle, *Glyptemys muhlenbergii*, is listed as threatened under the U.S. Endangered Species Act and is state endangered in Pennsylvania. Management and conservation of this species in the commonwealth is a joint effort of the U.S. Fish and Wildlife Service (USFWS) and the Pennsylvania Fish and Boat Commission.

USFWS Region 5 is designing a regional bog turtle database to provide better accounting for the federal Recovery Plan goals and measures of progress. PNHP Herpetologist, Kathy Gipe participated in a small committee that developed the structure of the relational database through weekly conference calls and edits in 2013 and early 2014. In March, a meeting of the regional recovery team for the bog turtle provided state and federal bog turtle biologists with an opportunity to review the database and begin populating the data. Data fields have been designed to crosswalk to Biotics but provide much more detailed information for long-term monitoring of turtles and habitats.



Charlie Eichelberger

The bog turtle is America's smallest turtle. Measuring just 3 to 4 inches as adults, they are no bigger than the palm of your hand. The greatest threats to the bog turtle are habitat loss and fragmentation.

Next Up: Raccoon Creek State Park

For many years, PNHP has provided information on rare species, plant communities, and critical resources to the Bureau of State Parks for conservation and management planning activities. PNHP has conducted biological survey and mapping activities at Gifford Pinchot, Canoe Creek, French Creek, Sinnemahoning, Ohioyle, Blue Knob, Ricketts Glen, Kettle Creek, Erie Bluffs, and Hickory Run/Lehigh Gorge State Parks, Kings Gap Environmental Education Center, Pine Grove Furnace, Caledonia, and Mont Alto State Parks. For all parks, PNHP analyzed the biological data collected during survey and mapping and developed a set of critical resource areas and management recommendations for use by park staff and state park planners. The collected information is used to update individual State Park Resource Management Plans.



White trout lily (*Erythronium albidum*) is a rare plant that grows on the floodplains of Raccoon Creek.

Pete Woods

This year, we will work at Raccoon Creek State Park, in Beaver County, one of Pennsylvania's largest state parks. The park is a collection of many different habitats – from reverting farmland to high quality forest and floodplains. The Raccoon Creek and Traverse Creek floodplains support a series of vernal pools, and the rich cove

forests are known for their abundance of spring wildflowers. One of the most popular and well known sites at Raccoon Creek State Park is the 314-acre Wildflower Reserve, where over 700 species of flowering plants have been documented on the floodplain of Raccoon Creek and adjacent slopes. Limestone-enriched soils in this area support rare species such as snow trillium (*Trillium nivale*), nodding trillium (*T. flexipes*), and white trout lily (*Erythronium albidum*), among many other spring ephemeral wildflowers. Virginia bluebells (*Mertensia virginica*) carpet the forest floor in early spring.

Other areas of the park have been the focus of many biological inventories, but are not as well-known as the Wildflower Reserve. We will concentrate our efforts in these areas in 2014. In early spring we will survey the park's vernal pools and inventory rich cove forests along the tributaries to Traverse Creek. From spring



Pete Woods

Raccoon Creek seen from the top of the cliffs on the eastern side of the creek. Exposures of the Ames limestone on these cliffs contribute calcium to the rich soils of the Wildflower Preserve.

into early summer, we will conduct fish assessments with the help of the Western Pennsylvania Conservancy's Watershed Conservation Program and the Pennsylvania Fish and Boat Commission. In late summer, PNHP botanists will survey the aquatic vegetation of Raccoon Creek Reservoir, a 100-acre lake at the heart of the park, and provide the results directly to the Bureau's Lake Management team to prioritize treatment for aquatic invasive species, such as Eurasian water milfoil (*Myriophyllum spicatum*). Following the survey activities this year, we will develop a detailed plant community map for the park and provide maps and data to the Bureau to inform park planning and management activities. We will focus on several areas determined to be Critical Resource Areas where specific management actions can be implemented, such as control of invasive plant species, to benefit native plants and animals.



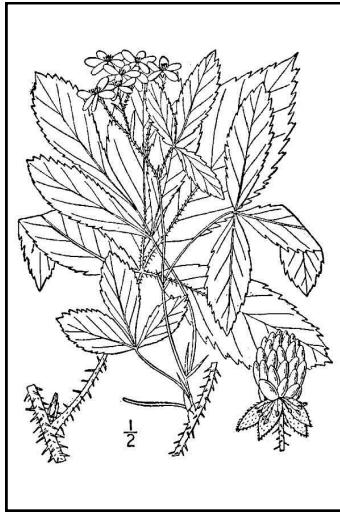
Pete Woods

Yellow water-crowfoot is a rare aquatic buttercup that grows in a vernal pool in the Wildflower Preserve.

We will submit the findings of our inventory and assessment work to the Bureau at the end of the year and provide comments on current management activities outlined in the existing Resource Management Plan for the park. After this long winter, we're all looking forward to getting out in the woods!

Updating Plant Statuses through Collaboration

Consider the case of the setose blackberry: ten specimens of this plant have been collected somewhere in Pennsylvania, and are now stored in cabinets of Pennsylvania's museum herbariums. Most are from the Pocono region and the Allegheny Mountains. But the most recent specimen is from 1963, and no one seems to have seen it since then.



Setose blackberry illustration

Britton and Brown Flora, 1913

It is notoriously difficult to distinguish the various species of blackberry, but this one is actually rather distinctive because it has green, upright stems covered in soft bristles. Pennsylvania is also at the very southern edge of its global range. Is this plant gone from the state, a possible victim of climate change? Or is it simply that no one has been looking for it?

Or, consider the Appalachian violet; this diminutive flower is considered to be globally rare, and was little-known from Pennsylvania just a decade ago. It was listed as "rare" in 1998; since then, botanists have been searching for the plant, and finding it in some surprising habitats – apparently, it doesn't mind an untidy lawn, with good sun and occasional mowing to eliminate tall competitors. However, there are still relatively few records of the plant in the PNDI database, and it is only known from a few counties in the southwestern part of the state. How rare is it really? Is it possible it is actually widespread enough that it doesn't need the



Appalachian violet

Jessica McPherson

protection of state listing? These are the kinds of questions we hope to answer this year through fieldwork in the Plant Status Updates Collaborative project.

Part of the Pennsylvania Natural Heritage Program's core mission to inventory and collect information about the state's natural biodiversity is to assess the conservation status of all of our native species. For plant species, we follow guidelines to determine which species should be considered secure, rare, threatened, or endangered based on how many populations are known, how many individuals are known, and ecological trends that affect the species' future viability in Pennsylvania. However, with almost 2,000 native plant species in the state, and an environment that is continually changing, assigning the right conservation status rank to every species is a big task that needs periodic updates to stay current.

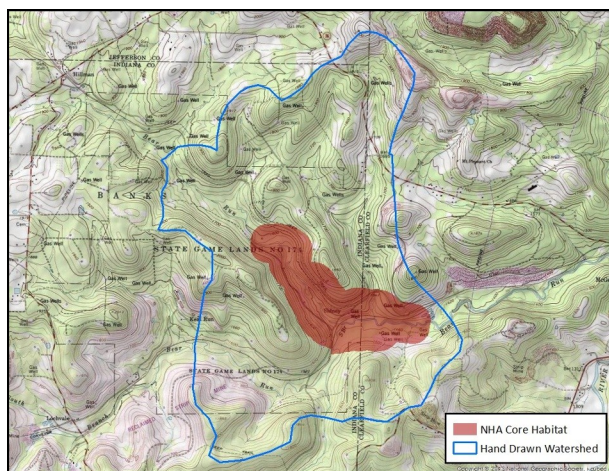
Last year, the Pennsylvania Department of Conservation and Natural Resources (DCNR) asked for extra effort towards resolving the status of a list of particularly mysterious plant species, including the setose blackberry and the Appalachian violet by designating fieldwork for these species as a Wild Resource Conservation Program (WRCP) priority. This year, PNHP is funded through WRCP to pursue a collaborative field project to better document these species with several other institutions.

We're partnering with other regional centers of botanical knowledge, including the Carnegie Museum of Natural History, the Cleveland Museum of Natural History, and the Morris Arboretum at the University of Pennsylvania. The partnership enables us to draw upon herbarium specimen data from regional institutions, which is one of the best sources of information about where plants occurred in Pennsylvania at different points in the past. Working with the experts at these institutions also pools together botanical knowledge from various regions of the state, in order to get the most complete picture of these species' status.

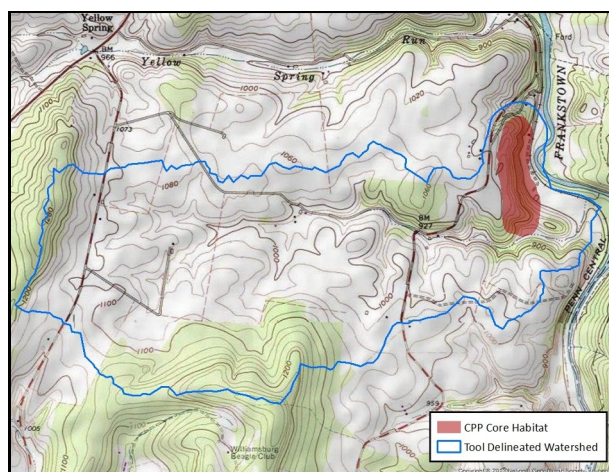
As part of the effort to improve documentation on these species, we're also encouraging amateur and professional botanists throughout the state to keep their eyes open for these species. You can see the full list of 29 species and also download a guide that includes identification tips and habitat description at <http://pabotany.org/pa-rare-plant-forum/>. If you find any of these plants in your travels, please let us know!

Better Maps with the Right Tools

One of the components of the CPP (Conservation Planning Polygon) project was to develop a set of Python tools. Python is a programming language used in GIS systems that was named after the Monty Python television series. The developers of ArcGIS have tightly integrated Python into their products to aid users in automating workflows quickly and easily. During the CPP project the GIS technicians outlined the core habitat polygon and supporting landscape polygon for each of our tracked species, over 24,000 polygons all together! This could not have been accomplished in the time frame available without the automated tools. We started the project with a few tools built in ArcGIS ModelBuilder. Before these tools, watersheds were delineated by hand and took up to a half hour per watershed. Now, using Python tools, each watershed only takes a few minutes. Since we have about 6,500 plants that incorporate the local watershed into their supporting polygon, the overall time savings with these new tools would be equivalent to one person working



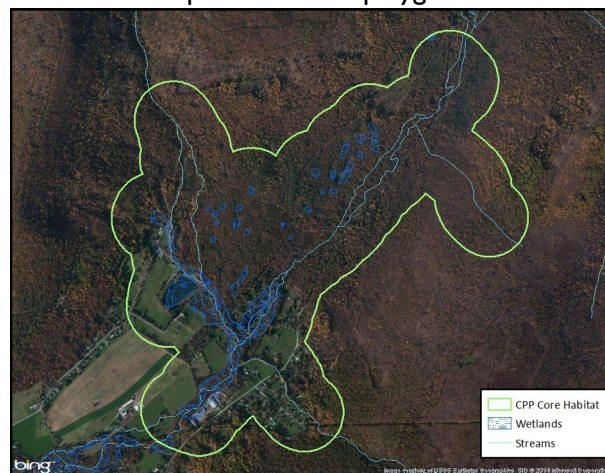
Hand-drawn watersheds took up to 30 minutes to draw.



Tool delineated watersheds are drawn in a few minutes and are more precise.

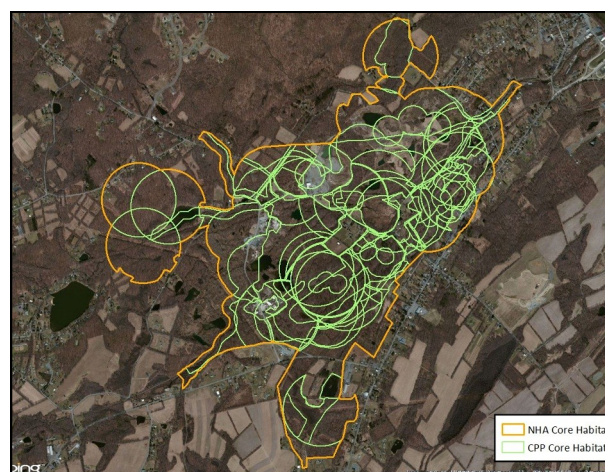
over one year drawing nothing but watersheds! PNHP is always looking for ways to incorporate new technology and innovations to provide better information and services to the Commonwealth of Pennsylvania.

All of the tools have now been converted to Python Toolbox tools, which provide more flexibility and are easier to share. The tool for the Pennsylvania Fish and Boat Commission species in the map below incorporates streams, National Wetland Inventory (NWI), and hand-drawn habitat and only takes a few seconds to complete the core polygon.



This CPP Core incorporates streams, NWI, and hand-drawn habitat

This quarter, a new tool was developed to aid in NHA (Natural Heritage Area) development. NHAs are areas described for planning purposes and are comprised of clusters of CPPs, and can include many different species, as seen in the map below. Within the NHA and associated tables, information must be recorded about the site and each species associated with the site. Previously, this required a lot of fields to be filled out for each NHA, but now most of that process is automated.



NHA Core that contains 30 different CPP Cores

Learning about Fire

In Pennsylvania, the use of prescribed fire for ecological restoration and forest management has become increasingly popular, especially among public land managers. Fire is now being used across the state to control invasive species, stimulate forest regeneration, and improve wildlife habitat. In partnership with The Nature Conservancy, PNHP will work with DCNR Bureau of Forestry, DCNR Bureau of State Parks, and the Pennsylvania Game Commission to improve our understanding of agency fire management goals on public lands.

We will conduct a comprehensive review of the natural fire and disturbance history in Pennsylvania, a review of the fire-management literature, and a review of fire-management policy from other mid-Atlantic states that are utilizing prescribed fire as a management tool. Following our literature review, we will conduct a series of interviews with representatives of Pennsylvania's land management agencies. We will focus on state parks and forests, and state Game Lands in Pennsylvania's ridge and valley and Pocono plateau ecoregions and hold preliminary meetings with jurisdictional agencies and public land managers who are most active in applying prescribed fire in these regions. In these interviews, we will attempt to clarify fire management goals from each agency, and determine the effectiveness of achieving management goals using prescribed fire.



A prescribed fire being utilized for habitat improvement at Jennings Environmental Education Center.

As a capstone for this project, we will establish priority fire management areas for state parks where there is interest in the use of prescribed burning. Priority management areas could include habitats that should be maintained in an early successional condition for ecological or aesthetic purposes or public-use areas



Lupine (*Lupinus perenis*), a Pennsylvania Rare species, responds positively to a number of disturbances, including prescribed fire.

where fire is applied to control tick populations or invasive species. To contribute to the Pennsylvania Game Commission's fire management planning within Pennsylvania's ridge and valley and Pocono plateau ecoregions, we will focus specifically on dry oak-dominated forests, barrens communities, and floodplain/grassland communities where fire could be used to improve habitat quality.

Pete Woods

Ryan Miller

Measures of Progress

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

Measure of Progress	Annual Goal (2014)	1st Quarter	Cumulative Total	Percent of Annual Goal
Biotics Records Updated	300	213	213	71%
New EOs Documented	800	166	166	21%
New Records Entered into HGIS	350	72	72	21%
Field Surveys Reported	500	4	4	1%
New CPPs Developed	400	160	160	40%
NHAs Updated	120	0	0	0%
Outreach to Local Government	20	4	4	20%

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.