



# Pennsylvania Natural Heritage Program

information for the conservation of biodiversity

Wild Heritage News

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Photo Banner:  
Fen, Erie County  
Pete Woods

## The Seeking of the Shrew

by

Charlie Eichelberger

In September of 1894, Samuel Rhoads was collecting mammals for the Academy of Natural Sciences along the Pennsylvania and New Jersey border. During that collecting trip, Rhoads deployed a number of traplines in order to inventory the small mammals found in the region. Later, in a brief article in the Proceedings of the Academy of Natural Sciences of Philadelphia, he recounts the collection of a shrew “along the banks of a rocky stream flowing into the Big Bushkill, Monroe County” and describes the specimen as an “eastern marsh shrew,” now known as the American water shrew (*Sorex palustris*). This was the first documentation of this species in the state.

Pennsylvania is home to two subspecies of the American water shrew, distinguished by disjunct ranges (separated by about 60 miles) and modest differences in fur color. The northern water shrew’s (*Sorex palustris albibarbis*) range encompasses the area roughly north of Route 80 and east of Route 79 with the exception of the few captured to the south in Mifflin and Snyder counties. The state-threatened West Virginia water shrew (*Sorex palustris punctulatus*) only occupies the very southwestern portion of the state with records known from Fayette, Somerset, and Westmoreland counties.

Despite this relatively broad distribution, the species remains confined to pockets of cool, clean, deeply-forested headwater streams with healthy aquatic invertebrate prey populations which the shrews forage for along the stream edge and bottom. The diet of the water shrew consists primarily of the aquatic larvae of stoneflies, caddisflies, mayflies, and craneflies, as well as slugs, earthworms, and salamanders that they find along the stream banks. Water shrews may also feed on small fish, including young brook



Charlie Eichelberger

No larger than the length of a dollar bill, the water shrew is the smallest diving mammal in the world.

trout, and in a reversal of roles the adult trout may end up occasionally eating a foraging shrew.

Water shrews have a number of adaptations suited for their semi-aquatic lives, including webbed hind feet that are fringed with stiff hairs to aid in diving. Water shrews are not only the smallest diving mammal on the planet; they are also capable of running on top of water for short stretches. Additionally, their fur is so dense that water does not penetrate the pelage and instead forms a pocket of air around the animal as it swims, causing the shrew to appear as a silver bubble on the bottom of the stream. This enveloping pocket of air requires the shrew to constantly kick while underwater, lest it quickly bob to the surface. While most dives are much shorter, water shrews have been known to dive for more than 45 seconds at a time.



Comb-like hairs along the water shrew's hind foot aid in swimming by increasing the surface area.

Charlie Eichelberger

Common to all shrews, the water shrew has an incredibly high metabolism. Shrew hearts beat up to 20 times per second, and they are so wound for activity that they require almost constant food intake to keep up with their metabolic needs. Water shrews weigh less than a half ounce, and need nearly their entire body weight (about 15 minnows worth) of food every day! The species has poor eyesight, and recent studies have found that water shrews sense underwater prey using a well-developed thicket of whiskers and smell prey by partially exhaling and inhaling air bubbles.

As for the water shrew's role in the ecology of these small headwaters, the species functions much like river otters (*Lontra canadensis*) do in larger waters; living along the waterway and diving to forage for aquatic prey as the system's top mammal. For these small streams, the water shrew is an important link in the transfer of energy from aquatic to terrestrial systems.

The water shrew faces a number of serious threats over much of its range in Pennsylvania. Climate change has the potential to alter the composition of the forest shading these headwater streams, which could lead to changes in water chemistry, and subsequently the biota of these fragile systems. Additionally, the recent boom

of shale gas development and the associated infrastructure has the potential to impact these waterways by altering water quality and changing microhabitat. Just how these changes will affect the biodiversity of our forests remains to be seen, but collection of baseline data to monitor changes is the first step towards minimizing further impacts.

In 2010, the Pennsylvania Natural Heritage Program was awarded a grant from the Wild Resource Conservation Program (WRCP) to develop protocols and gather baseline data for a number of species of concern considered to be vulnerable to global climate change and likely to be impacted by energy development. The water shrew was selected as the focal animal species for this project because of its vulnerability to environmental changes and usefulness as a bioindicator to monitor the overall health of these delicate systems. PNHP staff will also develop protocols and collect baseline data for several plant species of concern facing similar threats.



Streams lined by overhanging banks, or rock and root crevices serve as prime water shrew habitat.

Charlie Eichelberger

Prior to fieldwork we analyzed multiple GIS layers, including the locations of previous mammal survey efforts, to prioritize under-surveyed areas and update older occurrences of water shrews. Field survey efforts in 2011 documented a number of new occurrences, and have resulted in updated water shrew records on both public and private lands. We are planning more trapping effort and surveys in the spring of 2012.

It's easy to see why the water shrew has remained relatively understudied in Pennsylvania for so long -- their secretive nature, relatively low population sizes, and fast-paced life require considerable survey effort to detect them. As an important component of northern Pennsylvania's headwater streams, water shrews enable us to assess the overall health of these fragile stream systems by monitoring the populations of this unique and often overlooked species.

## Plant Community Classification will Help Determine Exceptional Value Status

by

Ephraim Zimmerman

Plant communities are defined generally as groups of plants that share a common environment and interact with each other, animal populations, and the physical environment. Because plant communities tend to occur within specific environmental settings and are repeatable across a landscape, they can be used to classify, describe, and map landscapes, and are tools for conservation planning and land protection activities.

Plant communities provide a way to describe places in greater detail – rather than just calling a wetland a wetland, a specific community name, such as Highbush Blueberry – Meadow-sweet Wetland, identifies the shrub species that are most common and provides a general description of the plants commonly associated with the type. Some communities like the Highbush Blueberry – Meadow-sweet Wetland are common, associated with large contiguous wetlands, and found throughout Pennsylvania, and thus are not considered rare. Other communities, such as the Sphagnum – Beak-rush Peatland, found in small wet depressions high in the mountains, or in the glaciated northwestern portion of the state, are driven by very specific environmental conditions and, as a result, are uncommon, rare, or extremely limited in Pennsylvania. These rare communities are often home to rare plants like orchids, unusual sedges, and other species uniquely adapted for specific conditions. In addition to being habitats for rare species, these unique communities are tracked by PNHP as communities of conservation concern.



Rare plant species that may be found in the Sphagnum–Beak-rush Peatland community include yellow-eyed-grass, horned bladder-wort, and bog-rosemary.

Ephraim Zimmerman

Plant communities for Pennsylvania were first described by PNHP in 1991 by Tom Smith and were re-classified in 1999 for a DCNR Bureau of Forestry publication titled “Terrestrial and Palustrine Plant Communities of Pennsylvania.” These documents have been used by DCNR and the Heritage Program to classify, describe, and map state forest and park lands across Pennsylvania. These described community types provide a foundation for management activities on state, private, and federal lands in the state.

In 2009, the PNHP began the process of updating and refining the wetland portion of the Pennsylvania Community Classification based on the results of recent ecological studies and data from mapping and inventory activities. Specifically, floodplain, vernal pool, and wet-thicket communities were assessed and described through projects funded by state and federal sources, including State Wildlife Grants, the EPA Wetland Development Program, and the Wild Resources Conservation Program. To engage experts outside the Heritage Program, PNHP worked with the Pennsylvania Biological Survey (PABS) to form a Community Ecology standing committee to assist in the process of updating the Pennsylvania Plant Community Classification. The new classification will be an interactive “living document,” which will include photos of the community types, conservation information, and links to data from recent studies. The website will be available in December 2011.

Defined plant communities, coupled with a basic understanding of the rarity of each community, play an important role in environmental review and conservation planning. Under the Pennsylvania Code (Section 105.17), the Pennsylvania Department of Environmental Protection (DEP) can designate wetlands as Exceptional Value (EV) based on a number of criteria including, but not limited to, whether the wetland provides habitat to rare plant or animal species, connects to a wild trout stream, or occurs within a designated state natural area. EV wetlands are afforded a greater level of protection from development activities. Exceptional Value significance is often granted when a state-listed plant or animal species is found within the wetland. Unfortunately, if survey activities do not document a rare plant or animal, then the wetland is not designated EV. The timing of the survey activity, exact location, level of effort, level of expertise, and survey method are among the many

reasons that surveys and assessments fail to uncover rare species. Adding rare plant communities to the list of criteria to designate EV status would improve conservation of high quality areas, since communities are often larger and more “detectible” throughout the season than individual species. However, in order to designate the wetland as EV based on the plant community alone, one must be able to accurately describe the community and determine if it is considered a rare type. Because of this, PNHP has worked to develop more comprehensive descriptions and identification tools that would enable DEP staff to more easily describe and map community types and to assign quality rankings to wetlands.

In 2009, PNHP received state and federal grants to update and refine the Pennsylvania Plant Community Classification, first created in 1999. The goals of the update were to incorporate data from several recent ecological studies into the classification and to increase its accessibility and use in management, conservation planning, and environmental review activities. As part of the project, PNHP created new, interactive, web-based fact sheets for each wetland type, and an identification key to aid in understanding and designation. The on-line information and identification key were designed for several levels of users.



JoAnn Albert

Ephraim Zimmerman collecting plot data in a Cottongrass—Sedge Wetland. These communities often occur in small patches on flat-lying land in headwater basins.

PNHP ecologists reviewed data from over 1,000 vegetation survey plots collected through various ecological studies, and validated the vegetation key at 365 accuracy assessment points throughout Pennsylvania in order to ensure the new types were well described and the vegetation key worked properly in field conditions that will be encountered by DEP staff. Through this project, 13 out of 71 wetland communities



Ephraim Zimmerman

Brad Eichelberger and Jessica McPherson survey a Hemlock Palustrine Forest at Black Moshannon Natural Area.

were designated as state endangered (S1 status), 6 state threatened (S2-status), and 13 state rare (S3-status). With rare, threatened, and endangered status determined for all wetland plant communities, and the tools available to accurately determine community types, wetlands containing these types may be nominated as EV wetlands and receive additional protections under the Water Quality Standards section of the Pennsylvania Code without needing to contain rare plant and animal species.

This project represented the first comprehensive assessment and update of wetland plant communities in Pennsylvania since the development of Terrestrial and Palustrine Plant Communities of Pennsylvania in 1999. The availability of the plant community fact sheets will enable a greater number of users to access the information in the Classification, and the identification key to the communities will allow for easier delineation and description of the types. As DEP staff utilize the tools within the new Pennsylvania Classification, additional protections afforded to EV wetlands will improve stewardship of plant and animal species within these important habitats.

## Pike and Delaware County Inventories Present Stark Contrasts

by  
Rocky Gleason

The County Natural Heritage Inventory (CNHI) projects across the state are nearly completed, with only three counties yet to have an initial inventory finished. A second generation of CNHI projects is currently updating the original information with additional fieldwork and landscape analysis. We recently completed two CNHI update projects, Pike County and Delaware County, which represent two facets of the wide range of landscapes and land use patterns within the state.

Delaware County, in the southeastern corner of the state, borders Philadelphia. The county has endured several centuries of human landscape modification, at first for agriculture and then for expanding urban and suburban development from the Philadelphia region. Since the original Delaware CNHI was completed in 1992, the county has experienced rapid development. When revisiting sites identified in the original CNHI report, we were dismayed to find that recent development activities had nearly eliminated habitat in areas previously identified as high priority for conservation. Fragments of suitable habitat persist, usually within public parks, conserved lands, homeowner association open space, and roadsides. Most of these fragments exist as islands of natural habitat within a sea of human-dominated landscape, often infested with a tangle of invasive species.



Rocky Gleason

Much of the remaining tidal habitat in Delaware County has been relegated to narrow strips crowded by development.

Despite these losses, Delaware County hosts 215 individual occurrences of species considered rare, threatened, or endangered; it falls 19th out of the commonwealth's 67 counties for the number of species of concern. This relatively high ranking for the third smallest county in the state is largely due to its being situated within the Coastal Plain Physiographic Province, only a small portion of which occurs in the state. The tidally influenced portion of the Delaware

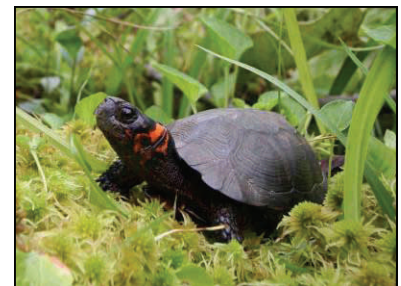


Rocky Gleason

Extensive mudflats along the shoreline of Little Tinicum Island in the Delaware River, Delaware County support numerous species of concern.

River in Delaware County contains tidal marsh communities that support a fair number of plants and animals considered to be at risk of state extirpation, largely because there is so little suitable habitat for them in the state. Delaware County's location on the southern border of the state also provides habitat for species that are at the very northern limit of their range, just barely occurring in the state, but common south of Pennsylvania.

Several species that occur in the county, however, are considered globally rare, including the bog turtle (*Glyptemys muhlenbergii*) and the serpentine aster (*Symphytotrichum depauperatum*). The bog turtle occurs sporadically in various seepage wetlands in the southeastern part of the state. Conservation of these habitats in this otherwise human-dominated landscape is essential for the continued survival of the species. The serpentine aster is restricted in range to the serpentine bedrock influenced habitats along the eastern border between Pennsylvania and Maryland. These habitats typically occur as small prairie-like openings historically maintained by the unique chemical attributes of serpentine-derived soils, but also through naturally occurring disturbances such as fire. In the absence of fire or



Charlie Eichelberger

Bog turtle



Rocky Gleason

A spruce palustrine forest is typically one of the zones of vegetation around bogs in Pike County.

other disturbances, these openings will eventually succeed to more common woodland and forest types, eliminating the unique serpentine habitat. Both the tidal marsh and serpentine barren habitats, like many other habitats in the county, have seen degradation and habitat loss since the original CNHI was completed.

Pike County, in the northeastern corner of the state, shares the Delaware River as a border with New York and New Jersey. The largely undeveloped landscape within Pike County contrasts markedly from that of Delaware County. Pike County is part of the Glaciated Low Plateau Physiographic Province and is dotted with glacially derived bogs, lakes, and wetlands largely within a forested context. The natural lakes and bogs support plant communities that are characteristic of more northerly habitats in New York and Canada. Most of the species of concern documented in Pike County are considered globally common, occurring much more frequently to the north of Pennsylvania.



Rocky Gleason

John Kunsman documents a population of prostrate sand cherry on a river scour outcrop of the Delaware River in Pike County.

This part of the Pocono region has long been a vacation destination from more populous areas, and it has seen its share of development over the years, especially that associated with lakes and other water bodies. Several hunting clubs that hold title to large properties were established in Pike County at the turn of the 20<sup>th</sup> century and have helped shape the character of the county with their dedication to conserving and maintaining habitat conducive to outdoor activities, especially hunting and fishing. In addition, large areas of the county are owned and maintained by the state as state forests, state parks, and state game lands.

The large portion of Pike County committed to public and private conservation along with abundant glacial wetlands and the cooler northern climate present excellent habitat opportunities for a number of species considered uncommon in Pennsylvania. Pike County currently has 471 individual occurrences of species of concern, placing it sixth out of Pennsylvania's 67 counties for the number of rare species. Roughly a third of these occurrences were new as documented by our recent inventory. Our survey effort in this county was rigorous, and PNHP staff visited as many high priority areas as possible in the two-year timeframe. However, since this region is biologically rich, there is still much opportunity for exploration in Pike County. We believe that additional survey effort is likely to turn up new occurrences of plants, animals, and communities of concern.

The CNHI update projects can act as a measure of success regarding the conservation of habitat critical to the commonwealth's most at-risk species. While the Pike CNHI update resulted in an encouraging expansion in the numbers of species of concern and habitats known to support them, the Delaware CNHI update documented a diminished account of species and their habitats. Pike County can plan for future development within the broader ecological context of the northeast region by using the large swaths of publicly and privately conserved land to provide essential connectivity between and among habitats. On the other hand, Delaware County needs to be particularly careful with the development of every additional acre in order to maintain habitat that is essential to the long term ecological needs of the southeast region.

## Notes from the Field

### Botany/Ecology

New records for two globally rare fern species were discovered this July. At Ohio State Park, PHNP botanists found a small population of Appalachian oak fern (*Gymnocarpium appalachianum*) while revisiting a known population of rock skullcap (*Scutellaria saxatilis*). Appalachian oak fern has conservation ranks of S1 (critically imperiled in Pennsylvania) and G3 (globally vulnerable). This is the third site for the species in Pennsylvania.

Also in July, we found a small patch of shinleaf or wintergreen (*Pyrola chlorantha*) growing in dry woodland in the Rothrock State Forest, Huntingdon County. This species was recently designated as Endangered in Pennsylvania by the Pennsylvania Biological Survey because of an apparent major decline in its frequency from historical population levels. For PNHP botanist John Kunsman, this was the first observation of the species in Pennsylvania in 35 years of botanizing.

Sideling Hill Creek Barrens is owned by the Western Pennsylvania Conservancy and hosts about a dozen species of rare plants and animals. The newest addition to that list is Laurentian bladder fern (*Cystopteris laurentiana*), which is also S1 and G3. It was discovered growing on exposed calcareous shale this summer by botany staff.

In late August and early September, PNHP botanists and contractors collected northeastern bulrush (*Scirpus ancistrochaetus*) leaf material at nine vernal ponds in Cumberland, Franklin, Mifflin, and Tioga counties as part of a study of genetic variability in this federally endangered species.



Northeastern bulrush

Late season botanical surveys for the limestone conservation assessment project have focused on limestone “prairies.” These sites have an unusual assembly of plant species, including many whose distributions are mainly much further west. Rare species typically found at these sites include sideoats



Jessica McPherson

Flat-topped goldenrod (*Solidago rigida*) blooming in a patch of sideoats grama grassland at Big Hollow, Centre County.

grama grass (*Bouteloua curtipendula*), false gromwell (*Onosmodium molle*), and flat-topped goldenrod (*Solidago rigida*). Although historical records suggest that at the time of European settlement these “prairies” were likely common in the limestone valleys of the Ridge and Valley Province, there are now very few known in Pennsylvania. Furthermore, these habitats require disturbance to maintain their herbaceous character, and after decades of fire suppression, many of those that remain are now threatened by woody overgrowth. We collected five plots of community data at three sites. With assistance from some very helpful botanists in Centre County, we documented 11 new rare plant populations. Our friends in Centre County also deserve kudos for re-discovering two species previously listed as extirpated in the state! We’ll let them announce the news, though.

Botany staff confirmed a new population (the first in at least two decades) of mountain pimpinella or mountain parsley (*Taenidia montana*) in the Buchanan State Forest in August. This globally vulnerable species, which typically grows in dry shale woodland, occurs in Virginia, West Virginia, Maryland, and Pennsylvania. All of Pennsylvania’s known populations are in Bedford County less than four miles from the Maryland border.

PNHP staff is continuing to examine the effects of climate change on aquatic species included in Pennsylvania’s State Wildlife Action Plan (WAP) using a climate change vulnerability index (CCVI) developed by

Charlisse Eichelberger

NatureServe. The focus of these analyses will be on mussels and fish found in aquatic systems in Pennsylvania. The results from previous climate change assessments completed by PNHP staff were presented at a climate change symposium hosted by the Cleveland Museum of Natural History.

### Zoology

PNHP staff continued surveys throughout Bureau of Forestry (BOF) lands, documenting critical habitat for timber rattlesnakes in Elk, Forbes, Moshannon, and Sproul state forests. An active woodrat site was also discovered on Sproul State Forest. At a monitoring project for the state-threatened green salamander, which is adjacent to a wind farm site in Fayette County, we discovered two previously unknown populations of green salamanders.

Staff assisted the Pennsylvania Game Commission (PGC) with surveys for Indiana bats in York and Adams counties, but unfortunately, no Indiana bats were captured. Bat surveys were also conducted in Michaux State Forest as part of the Big Pine Flats project. During those surveys, several species were documented, including the northern myotis (*Myotis septentrionalis*) and the state-threatened small-footed bat (*M. leibii*).

Over 30 surveys were conducted for crayfish, focusing on *Cambarus acuminatus*, which is currently only known from four small drainages in the southeastern part of the state.

We assisted with an environmental review of the Northumberland Anthracite Outdoor Adventure Area at the request of DCNR. Portions of this site were previously mined for coal. Site developers will turn heavily impacted portions of the site into an all-terrain vehicle park (which is also its current unregulated use). More intact areas will be set aside for passive recreation.

Fieldwork for a study on the state-threatened red-bellied turtle in the Delaware and Schuylkill rivers, in cooperation with Pennsylvania Fish and Boat Commission (PFBC) staff, began this quarter and will resume in the spring of 2012. This marks the initiation of a long-term project to gain an understanding of the turtle's movement during different seasons of the year.



Red-bellied turtle

Kathy Gipe

The freshwater mussel crews were very busy this quarter, conducting fieldwork across the region in cooperation with many different partners, including the PFBC and Pennsylvania Department of Environmental Protection. Highlights include 17 surveys on the Lower Susquehanna, 57 mussel surveys in the West Branch of the Susquehanna, five surveys for pistolgrip mussel (*Tritogonia verrucosa*) and round hickorynut (*Obovaria subrotunda*) in the Little Shenango River, initiation of surveys for the eastern pearlshell (*Margaritifera margaritifera*) in the Little Schuylkill River, and much fieldwork associated with a project aimed at identifying native mussel refuges in Lake Erie and several tributaries.



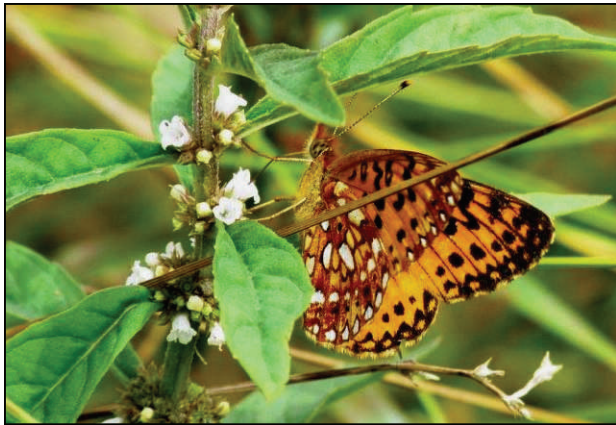
Beth Meyer

Aquatic interns, Andrew Halmi and Eric Keller, excavating a quadrat during a quantitative survey for freshwater mussels in Swatara Creek near Hershey.

Zoology staff completed, published, and/or submitted several reports and papers this quarter. A report was completed on the mussels of the Allegheny River navigational pools, and two papers were produced on crayfish including a soon to be published paper on the conservation and management of Pennsylvania's crayfish. Additionally, two staff members attended the Northeastern Partners in Amphibian and Reptile Conservation meeting outside of Baltimore, Maryland.

PNHP staff conducted surveys for rare invertebrates at ten sites in Clinton, Sullivan, Clearfield, Adams, and Franklin counties. One species of concern, the ocellated darner (*Boyeria grafiana*), presented itself beside the door of the inn where we were staying. The most exciting site had dion skippers (*Euphyes dion*), northern-eyed browns (*Satyroides eurydice*), and Atlantis fritillaries (*Speyeria atlantis*) in or adjacent to a formerly flooded pond that is now an extensive boggy, wet sedge meadow. Multiple old invertebrate element occurrence records were updated, including records for the riffle





Betsy Leppo

The silver-bordered fritillary is a vulnerable species in Pennsylvania, with declines noted in many parts of its historical range. Climate change may push this already peripheral northern species out of the state.

snaketail (*Ophiogomphus carolus*), Maine snaketail (*Ophiogomphus mainensis*), and the superb jewelwing (*Calopteryx amata*) on healthy streams in Sullivan County. Beautiful silver-bordered fritillaries (*Boloria selene*) were found in several sphagnum-sedge wetlands.

PNHP staff continued invertebrate diversity surveys at Slaughtering Ground Barrens in Clinton County using four types of traps: blacklight, malaise, pitfall, and yellow pans. Six surveys were conducted during this quarter. Pete Woods took over during the month of July, including a trip in 100°F weather. We thank Pete for his fortitude in the face of brutal heat. We also enjoyed the presence of timber rattlesnakes, bears (as evidenced by damaged traps), and garbage-bag-clad biologists. The site appears very interesting in terms of insect composition and diversity.



Betsy Leppo; Sally Ray

Bear damage to a malaise trap and Betsy Leppo in high-tech rain gear at Slaughtering Ground Barrens.

We continued a Lepidoptera (butterfly and moth) survey of the Big Pine Flat barrens in Cumberland County. Two blacklight surveys were conducted during this quarter. The data collected from these surveys will help land managers plan various land use and stewardship activities.

### Information Management

Conservation Information Staff continue to process and update data, and respond to internal and external data requests. We are continuing to scan all of our paper documentation to create an electronic archive, and to digitize survey areas that will become part of the field survey GeoDatabase. Development of Conservation Planning Polygons (CPP) has been expanded to include plants. Several staff have been involved in the development and testing of the plant CPP specifications.

Kierstin Carlson attended the Pennsylvania Invasive Species Council Meeting in July. PNHP is continuing to work with New York Heritage to implement the Pennsylvania node for the iMAP Invasives on-line tool.

### Conservation Planning

We attended several Lake Erie-Allegheny Plateau (LEAP) partnership meetings for the development of the LEAP Biodiversity Plan. This region spans from the northern portion of Ohio through the western edge of New York State including a large portion of northwestern Pennsylvania. Our role in this project is to provide data and analysis for our portion of the region and contribute to the completion of the plan.

We have also developed GIS based tools that will assist in the development of Conservation Planning Polygons (CPPs). When drawing a CPP for particular taxa, these tools will automate several steps in the process and result in a significant time savings.

### County Inventory

County Inventory staff continued survey efforts through the field season for the Lehigh Valley CNHI update (Lehigh and Northampton Counties). These surveys for species of concern and exemplary natural communities will be used to inform the greenways planning process and PennDOT road maintenance activities within the two-county area. This project will have an additional year of field surveys with a project completion date anticipated in June 2013.

## Measures of Progress

The following Measures of Progress have been expanded and defined more precisely for 2011. We believe that these measures 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 (2011)	1st Quarter	2nd Quarter	3rd Quarter	Cumulative Total	Percent of Annual Goal
Biotics Records Updated	200	140	528	153	821	100%
New EOs Documented and Entered into Biotics	800	157	188	272	617	77%
New Records Entered into HGIS	300	116	144	158	418	100%
Percent of HGIS Records > 10 Years Old	50	53	51	50	N/A	N/A
Field Surveys Performed	400	0	354	108	462	100%
New CPPs Developed	1000	41	73	0	114	11%
Site Polygons Created and Attributed	400	0	47	221	268	67%
Management Plans/Guidelines Developed	30				4	13%
State Parks		0	3	0		
PA Game Commission		0	0	0		
Other		1	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 and Entered into Biotics** is a way to measure the success of our inventory effort in finding new occurrences of plants, animals, and exemplary natural communities. All new records entered into the database are counted.

**New Records Entered into HGIS** indicates our level of activity in reviewing, quality controlling, and entering 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.

**Percent of HGIS Records > 10 Years Old** is an indicator of the currency of data critical to the environmental review process. Keeping records as current as possible helps reduce the time needed to make decisions and determine a course of action for a given project under review.

**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.

**Site Polygons Created and Attributed** is a measure of our effort in developing, mapping, and describing sites 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.

**Management Plans/Guidelines Developed** is a direct indicator of our activity in utilizing our data and expertise to write management plans for a variety of clients and projects. We are increasingly called upon to provide this service and it will likely represent a substantial programmatic effort.