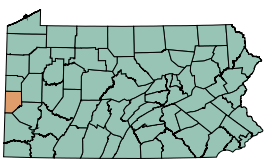
Beaver County Natural Heritage Inventory



Update 2014

PNHP

Pennsylvania Natural Heritage Program

Beaver County Natural Heritage Inventory Update 2014

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The Pennsylvania Natural Heritage Program (PNHP)is a partnership between the Western Pennsylvania Conservancy (WPC), the Pennsylvania Department of Conservation and Natural Resources (DCNR), the Pennsylvania Game Commission (PGC), and the Pennsylvania Fish and Boat Commission (PFBC). PNHP is a member of NatureServe, which coordinates natural heritage efforts through an international network of member programs—known as natural heritage programs or conservation data centers—operating in all 50 U.S. states, Canada, Latin America and the Caribbean.

This project was funded through grants provided by the Pennsylvania Department of Conservation and Natural Resources, Wild Resources Conservation Program.

This reference may be cited as:

Pennsylvania Natural Heritage Program. 2014. Beaver County Natural Heritage Inventory Update 2014. Western Pennsylvania Conservancy. Pittsburgh, PA.

ACKNOWLEDGEMENTS

We would like to acknowledge the citizens and landowners of Beaver County and surrounding areas who volunteered information, time, and effort to the inventory and granted permission to access land. A big thank you goes to those who suggested areas of interest, provided data, and assisted with field surveys, including Ben Coulter, Jeffrey Zablow, and Mark Vass. Additional thanks goes to Frank Mancini, Doniele Russel, William Evans, and Sara Knapp of the Beaver County Planning Commission for providing support for this project.

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We want to recognize the Pennsylvania Natural Heritage Program and NatureServe for providing the foundation for the work that we perform for these studies. Current and former PNHP staff that contributed to this report includes JoAnn Albert, Kierstin Carlson, Kristen Erath, Steve Grund, Tyson Johnston, Susan Klugman, Betsy Leppo, Michael Maret, Jessica McPherson, Ryan Miller, Elizabeth Meyer, Benjamin Plunkett, Erika Schoen, Scott Schuette, Christopher Tracey, Jeff Wagner, Mary Walsh, David Yeany, and Ephraim Zimmerman.

The species information utilized in the inventory came from many sources as well as our own field surveys. We wish to acknowledge all of those who carried out botanical and zoological survey work over the years. Biologists, both on their own and from institutions and agencies such as the Carnegie Museum of Natural History, the Department of Conservation and Natural Resources, the Pennsylvania Game Commission, and the Pennsylvania Fish and Boat Commission have contributed numerous plant and animal records over the years. The task of inventorying the natural heritage of the county would have been much more difficult and incomplete without this tremendous pool of information gathered by many people over many years.

Finally, we especially wish to thank the landowners who granted us permission to conduct inventories on their lands. Without their support, this report would have been far less complete.

This project was funded through grants provided by the Pennsylvania Department of Conservation and Natural Resources, Wild Resources Conservation Program. Support was also provided by the Beaver County Planning Commission.

We encourage comments and questions. The success of the report will be measured by the use it receives and the utility it serves to those making decisions about resources and land use throughout the county. Thank you for your interest.

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THE PENNSYLVANIA NATURAL HERITAGE PROGRAM

The Pennsylvania Natural Heritage Program (PNHP) is a partnership between the Western Pennsylvania Conservancy (WPC), the Pennsylvania Department of Conservation and Natural Resources (DCNR), the Pennsylvania Game Commission (PGC), and the Pennsylvania Fish and Boat Commission (PFBC). Founded in 1982, PNHP is part of a network of *Natural Heritage Programs* that utilizes common methodology developed by Heritage Programs and The Nature Conservancy, and refined through NatureServe – the organization that represents the network of Natural Heritage Programs (see the box at right).

PNHP collects and stores location and baseline ecological information about rare plants, rare animals, unique plant communities, significant habitats, and geologic features in Pennsylvania. The PNHP database is Pennsylvania's chief storehouse of such information with over 20,000 detailed digital occurrence records. Though not a regulatory organization, as part of its function PNHP provides expert input on species impacted by projects that require permits as issued by the Pennsylvania Department of Environmental Protection (DEP). Although data from PNHP feed into the environmental review tool known as the Pennsylvania Natural Diversity Inventory (PNDI), the process of environmental review is housed within DCNR, PFBC, and PGC.

As part of the information maintained by PNHP, a system of *global ranks* and *state ranks* is used to describe the relative degree of rarity for species and natural communities. This system is especially useful in understanding how imperiled a resource is throughout its range, as well as understanding the rarity of resources that do not have official state status, such as invertebrate animals and natural communities. A summary of global and state ranks can be found in the methods section.

NatureServe A Network Connecting Science With Conservation

NatureServe, the natural heritage network, was originally founded by The Nature Conservancy in the early 1970s, with the first program established in South Carolina in 1974. The concept was to create a federation of programs in all 50 U.S. states, using a common database and data management methodology to document the extent of biodiversity throughout the country, with an emphasis on rare and threatened species and natural communities. Many programs were established with state environmental protection or natural resource agencies, while some are housed in universities. Pennsylvania's partnership with three agencies and a non-profit is unique among the programs.

Over time the heritage network has expanded throughout Canada and 12 Latin American countries. In 1994, the Association for Biodiversity Information (ABI) was founded to more closely coordinate activities of the network, and ABI transformed into NatureServe in 2001 as The Nature Conservancy transferred administration of the network to NatureServe.

All programs in the heritage network use a common data management system outlined on these pages, based on the original concepts of elements, element occurrences, and rarity ranks. Today, the NatureServe network stands as the most comprehensive source of information on the locations and status of biodiversity and natural communities throughout the western hemisphere.

PNHP is valuable for its ability to supply technically sound data that can be applied to natural resource decisions. Information on the occurrences of elements of special concern (species and natural communities) gathered from museums, universities, colleges, and recent fieldwork by professionals throughout the state is used by PNHP to identify the areas of highest natural integrity and significance in Beaver County.

The Beaver County Natural Heritage Inventory (CNHI) report presents the known outstanding natural features in the county. The CNHI provides maps of the best natural communities (habitats) and all the known locations of animal and plant species of concern (endangered, threatened, or rare) in the county. A written description and a summary table of each of the sites, including quality and degree of rarity are included.

INTRODUCTION

This project is a comprehensive update to the earlier Beaver County Natural Areas Inventory project of 1993. This current project was initiated to update the documentation of previously known species of concern (those considered at risk of local or global extinction), to identify additional habitats supporting species of concern, and to provide conservation recommendations to help ensure their continued survival within the region. The ability of a community to fulfill its vision for the future depends on its capacity to assemble information that will enable it to act effectively and wisely. Since 1989, County Natural Heritage Inventories (CNHIs) have served as a way to both gather and pass along new and existing information to those responsible for land use decisions, as well as to all residents who wish to know more about the natural heritage of their county. The Beaver County Natural Heritage Inventory focuses on the best examples of living ecological resources in the county. The Western Pennsylvania Conservancy (WPC) served as the principal investigator, prepared the report, and created the maps for this study. The Pennsylvania Natural Heritage Program (PNHP), of which WPC is a partner, is responsible for collecting, tracking, and interpreting information regarding the state's biological diversity.

A healthy natural environment is essential to human health and sustenance. A healthy environment provides clean air and water; supports fish, game, and agriculture; and furnishes renewable sources of materials for countless aspects of our livelihoods and economy. In addition to these direct services, a clean and healthy environment plays a central role in our quality of life, whether through its aesthetic value (found in forested ridges, mountain streams and encounters with wildlife), or in the opportunities it provides for exploration, recreation, and education. Finally, a healthy natural environment supports economic growth by adding to the region's attractiveness as a location for new business enterprises, and provides the basis for the recreation, tourism, and forestry industries, all of which have the potential for long-term sustainability. Fully functional ecosystems are the key indicators of a healthy environment and working to maintain ecosystems is essential to the long-term sustainability of our economies.

Planning for long-term sustainability can maintain open space, including natural environments and the plants and animals associated with them. Using this Natural Heritage Inventory as a conservation tool can steer development away from environmentally sensitive areas, creating a needed balance between economic growth and the conservation of natural resources. It is important that county and municipal governments, the public, developers, and planners know the location of such environmentally sensitive areas in order to maintain and protect these areas. Knowing where these areas are located can help prevent potential land use conflicts, and help focus conservation efforts and limited funds on the most vulnerable areas. The Pennsylvania Natural Heritage Program, in cooperation with the Beaver County Planning Commission, has undertaken this project to provide a document and maps that will aid in the identification of these important areas.

The *Beaver County Natural Heritage Inventory (CNHI) Update 2014* represents the known species of concern, including plants, animals, and natural communities in Beaver County. The inventory provides maps of the best natural communities (habitats) and the locations of animal and plant species of concern (rare, threatened, and endangered) in Beaver County. These maps do not pinpoint the exact location of the species of concern but rather represent a conservation zone that is critical to the preservation of the site (Core Habitat), and a surrounding zone of potential impacts (Supporting Landscape) where applicable. A written description including threats and disturbances, conservation recommendations, and a summary table of the species of concern, including degree of rarity, last-observed date, and quality rank accompany each map. Potential threats and stresses, and suggestions for protection of the rare communities, plants, or animals at the site are included in the individual site descriptions.

The information and maps presented in this report provide a useful guide for planning residential or commercial developments, recreational parks or trails, for conserving natural areas, and for setting priorities

for the preservation of the most vulnerable habitats. All of the sites in this report were evaluated for their importance in protecting biological diversity on a state and local level, but many also have scenic value, provide water quality protection, and are potential sites for low-impact passive recreation, nature observation, and/or environmental education.

The Beaver County Natural Heritage Inventory – Update 2014 will be made available to each municipality through the Beaver County Planning Commission. The Natural Heritage Inventory is a conservation tool that will aid in the creation of municipal and county comprehensive plans. Its emphasis on biological diversity should inform county and regional open space plans already underway, or updates to those plans already completed. Beaver County, its municipalities, land trusts, and other organizations can also use the Natural Heritage Inventory to identify potential protection projects that may be eligible for funding through state or community grant programs.

Landowners will also find this inventory useful in managing and planning for the use of their land; it gives them the opportunity to explore alternatives that will provide for their needs and still protect the species and habitats that occur on their land. For example, the Forest Stewardship Program, coordinated by the Pennsylvania Department of Conservation and Natural Resource's Bureau of Forestry, assists landowners in creating management plans. These plans incorporate landowner objectives (e.g., wildlife or timber management). Other programs include the USDA's Forest Legacy Program and the Pennsylvania Department of Agriculture's Agricultural Land Preservation Program. Land managers may wish to consult with this report and the environmental review tool found on the Pennsylvania Natural Heritage Program's website (www.naturalheritage.state.pa.us) in an effort to avoid potential conflicts in areas with species of concern and/or identify ways of enhancing or protecting these resources.

Beaver CNHI Update Changes

The Beaver CNHI 2014 Update report is meant to replace the original Beaver County Natural Areas Inventory that was completed in 1993. The original 1993 report was based on two years of field work supplemented by existing data to inform the report. The 2014 update followed the basic model of the original 1993 project with two years of field work and existing data in the PNHP database used to inform the 2014 Update report.

Natural Heritage Area (NHA) Name Changes

Sites in the previous report were referred to Biological Diversity Areas (BDAs), Landscape Conservation Areas (LCAs), Dedicated Areas (DAs), and Other Heritage Areas (OHAs). All of these sites of ecological significance are now referred to as Natural Heritage Areas (NHAs).

Changes in number of significant ecological features and shape of NHA mapping

The natural resources of the region are in continually changing. As habitats and land use patterns change, so do the species that occupy them. Periodic updates to the Beaver County Natural Heritage Inventory will be necessary to reflect these changes. The Natural Heritage Areas depicted in this report in many cases differ significantly from the previous report. There are several reasons why this has occurred:

- The primary cause for changes in shapes of Natural Heritage Areas is the use of a different protocol for mapping the species of concern. The sites developed in past reports were drawn by different biologists at different times for many different species using best professional judgment. This often resulted in vast discrepancies between sites drawn for the same species by different biologists. In order to achieve a more standardized approach to NHA depiction, the Pennsylvania Natural Heritage Program has developed a more formulaic method for identifying areas of concern around each species present at any one location. This approach includes representing "Core Habitat" and

"Supporting Landscape" separately rather than combined as in previous reports. Please see the methods section for a description of "Core Habitat" and "Supporting Landscape."

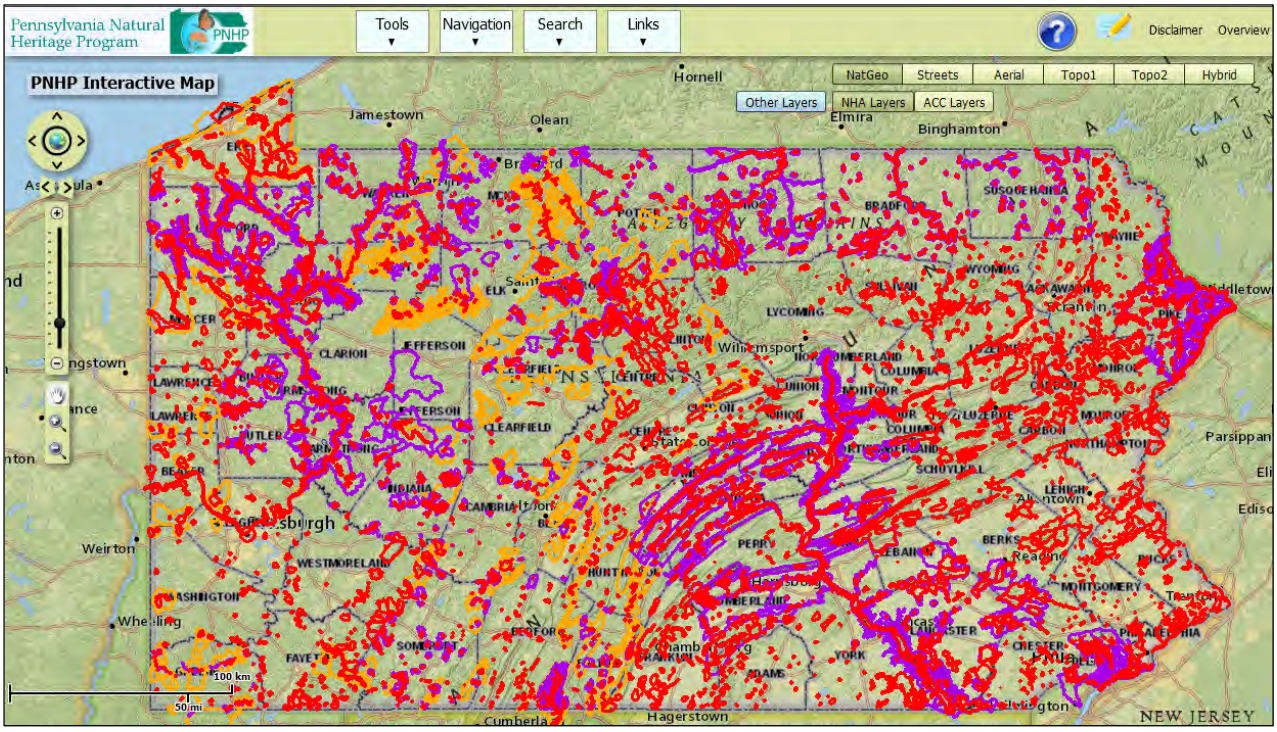
- Some species documented in the previous report, through additional fieldwork across the state, have been found to be more common than previously thought and have been delisted, and are no longer considered to be species of concern. If an area documented in the previous report only contained a species of concern that has since been delisted, it would no longer be represented in this report, which focuses on those species considered to be at risk of global extinction or local extirpation.
- Several areas that were in close proximity to each other have been combined into one NHA.
- Some large sites have been split into smaller, more discrete NHAs.
- Some areas were enlarged if additional fieldwork expanded the known extent of a population of species of concern at a location.
- Some areas were eliminated if the habitat at the location was considered no longer able to support the species formerly documented at the location. This may have resulted from significant changes to, or destruction of, the suitable habitat.
- Former "Locally Significant" areas were not considered in this report since NHAs are currently only developed for locations supporting species of concern.
- Former "Significant Geologic Features" were not considered for this report as they are not living resources.
- Many new NHAs have been added for several reasons:
    - New field work resulted in the documentation of new locations for species of concern.
    - Species formerly not tracked have been added to the species of concern list due to declines in known populations (e.g., wood turtle).
    - Use of a longer time frame from which to draw data. The past cutoff date beyond which records were not considered for these reports was 1980. Now employed is a "rolling window" of 50 years to more closely reflect what is considered in the environmental review process. For the date of this report, 2014, the cutoff date is 1964.
    - Some entire groups of organisms were not previously considered for reports and now are (e.g., dragonflies). The PNHP previously lacked sufficient taxonomic expertise, or comprehensive species distribution data, to consider groups of organisms which are now included in the report.

Document layout

The 1993 Beaver NAI was organized by USGS quadrangle. The 2014 Update is organized alphabetically by NHA name, with only one site depicted on each map. The scale of each map is based on the relative scale of the NHA.

Statewide Coverage

The information depicted in this report will be integrated into the PNHP "Statewide County Natural Heritage Inventory Map," a web-based application of all existing Pennsylvania CNHI information (http://www.naturalheritage.state.pa.us/cnhi/cnhi.htm). The areas highlighted in the CNHIs represent sensitive natural features within each county have been merged into a single layer to provide a seamless statewide coverage. This statewide layer of existing NHAs allows for a landscape level review of the sensitive ecological features of the state.



Biodiversity in Pennsylvania

An ecosystem is the complex of interconnected living organisms inhabiting a particular area or unit of space, together with their environment and all their interrelationships and relationships with the environment. All the parts of an ecosystem are interconnected, the survival of any species or the continuation of a given natural process depends upon the system as a whole, and in turn, these species and processes contribute to maintaining the system. An important consideration in assessing ecosystem health is the concept of biodiversity. Biodiversity can be defined as the full variety of life that occurs in a given place, and is measured at several scales: genetic diversity, species, natural communities, and landscapes.

Genetic diversity refers to the variation in genetic makeup between individuals and populations of organisms and provides a species with the ability to adapt successfully to environmental changes. In order to conserve genetic diversity, it is important to maintain natural patterns of gene flow through the migration of individual plants and animals across the landscape and the dispersal of pollen and seeds among populations (Thorne et al. 1996). Individual species play a role in sustaining ecosystem processes such as nutrient cycling, decomposition, and plant productivity; declines in native species diversity alter these processes.

A natural community is an interactive assemblage of plant and animal species that share a common environment and occur together repeatedly on the landscape, such as a red maple swamp. Each type of natural community represents habitat for a different assemblage of species, hence identification and stewardship of the full range of native community types is needed to meet the challenge of conserving habitat for all species.

From an ecological perspective, a landscape is a large area of land that includes a mosaic of natural community types and a variety of habitats for many species. At this scale, it is important to consider whether communities and habitats are isolated or connected by corridors of natural landscape traversable by wildlife, and whether the size of a natural landscape is sufficient to support viable populations and ecosystems. Because the living and non-living elements of an ecosystem are interconnected and interdependent, it is essential to conserve native biodiversity at all of these scales, from genes through landscapes, if ecosystems are to continue functioning.

Pennsylvania's natural heritage is rich in biodiversity and the state includes many examples of high quality natural communities and large expanses of natural landscapes. Over 20,000 species are known to occur in the state, and the extensive tracts of forest in the northern and central parts of the state represent a large portion of the remaining areas of suitable habitat in the mid-Atlantic region for many forest-dependent species of birds and mammals. Unfortunately, biodiversity and ecosystem health are seriously threatened in many parts of the state by pollution and habitat loss. Of all the animals and vascular plants that have been documented in the state, more than one in ten are imperiled; 156 have been lost entirely since European settlement and 351 are threatened or endangered. Many of these species are imperiled because available habitat has been reduced and/or degraded.

Fifty-six percent of Pennsylvania's wetlands have been lost or substantially degraded by filling, draining, or conversion to ponds. According to the Pennsylvania Department of Environmental Protection (DEP), 60 percent of those Pennsylvania lakes that have thus far been assessed for biological health are listed as impaired. Of 83,000 miles of streams in Pennsylvania, almost 70,000 miles have been assessed for water quality. From this, nearly 11,000 miles have been designated as impaired due to abandoned mine discharges, acid precipitation, and agricultural and urban runoff. The species that depend on these habitats are correspondingly under threat: 58 percent of threatened or endangered plant species are wetland or aquatic species; 13 percent of Pennsylvania's 200 native fish species have been lost, while an additional 23 percent are imperiled. Among freshwater mussels, one of the most globally imperiled groups of organisms, 18 of Pennsylvania's 67 native species are extirpated (meaning locally extinct) and another 22 are imperiled.

Prior to European settlement, over 90 percent of Pennsylvania's land area was forested. Today, 60 percent of the state is still forested, but much of this forest is fragmented by roads, utility rights-of-way, agriculture, and development. Only 42 percent is interior forest habitat; meaning that some of the species that depend upon interior forest habitat are in decline. In addition to habitat fragmentation, forest pests, acid precipitation (which causes nutrient leaching and stunted growth), over browsing by deer and invasive species also threaten forest ecosystem health.

The Pennsylvania Natural Heritage Program (PNHP) in cooperation with the Pennsylvania Biological Survey (PABS) assesses the conservation status of species of vascular plants, vertebrates, and a few of the invertebrate groups native to Pennsylvania. While Pennsylvania hosts a diversity of other life forms, too little information is known about the distribution of mosses, liverworts, lichens, fungi, and most invertebrates to assess their conservation status at this time. Without information about all of the species, it is possible to protect at least some rare species by conserving rare natural communities. Species tend to occur in specific habitats or natural communities, and by conserving examples of all natural community types we will also conserve many of the associated species, whether or not we even know what those species are. Thus, the natural community approach is a coarse filter for broad scale biodiversity protection, while the fine filter approach is used for those individual species for which it is feasible.

The goals of this report are to identify areas important in sustaining biodiversity at the species, natural community, and landscape levels and to provide that information to more fully inform land use decisions. County Natural Heritage Inventories (CNHIs) identify areas in the state that support Pennsylvania's rare, threatened, or endangered species as well as natural communities that are considered to be rare in the state or exceptional examples of the more common community types. A description of each area's natural features and recommendations for maintaining their viability are provided. Also, in an effort to provide information focused on planning for biodiversity conservation, this report includes species and natural community fact sheets, references, and links to information on invasive exotic species. Together, with the other land use information, this report can help guide the planning and land management necessary to maintain the ecosystems on which our natural heritage depends.

NATURAL HISTORY OVERVIEW OF BEAVER COUNTY

Beaver County is rich in history, and scenic and natural resources. However, its rural character, natural resources, and farmland are all seriously threatened by the conversion of farmland and natural habitats to suburban and commercial uses, a trend common throughout southwestern Pennsylvania. Major interstate highways linking Beaver County to metropolitan centers have made commuting to Pittsburgh feasible.

The scenic and natural environments that have attracted many people to the county are quickly being lost because of increased development. Wise planning can maintain these natural environments and the plants and animals associated with them. A balance between growth and preservation of scenic and natural resources can be achieved by guiding development away from the most environmentally sensitive areas.

Physiography & Geology

Characteristic landscapes and distinctive geological formations define Physiographic Provinces (Figure 1). Physiography relates in part to a region's topography and climate. These two factors, along with bedrock type, significantly influence soil development, hydrology, and land use patterns of an area. Additionally, both physiography and geology are important to the patterns of plant community distribution, which in turn influences animal distribution. Because of the differences in climate, soils, and moisture regime, certain plant communities would be expected to occur within some provinces and not in others.

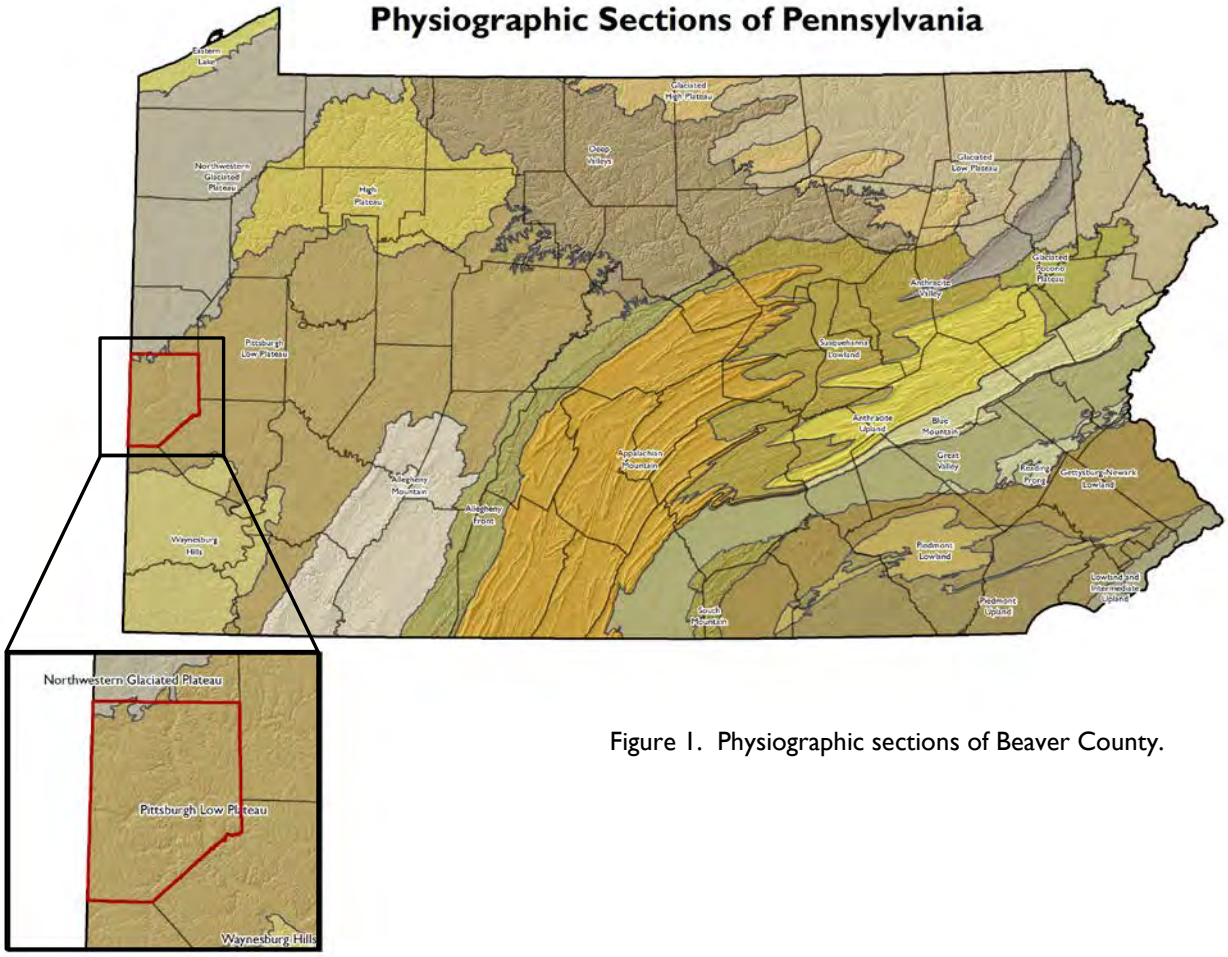


Figure 1. Physiographic sections of Beaver County.

Pittsburgh Low Plateau

The Pittsburgh Low Plateau Section of the Appalachian Plateaus Province consists of a smooth undulating upland surface cut by numerous, narrow, relatively shallow valleys. The uplands are developed on rocks containing the bulk of the significant bituminous coal in Pennsylvania. The landscape reflects this by the presence of operating surface mines, many old stripping areas, and many reclaimed stripping areas. The local relief on the uplands is generally less than 200 feet. Local relief between valley bottoms and upland surfaces may be as much as 600 feet. Valley sides are usually moderately steep except in the upper reaches of streams where the side slopes are fairly gentle. Some of the land surface in the southwestern part of the Section is very susceptible to landslides.

Northwestern Glaciated Plateau

A narrow edge of the northern part of the county lies in the Northwestern Glaciated Plateau section of the Appalachian Plateaus Physiographic Province. This section is characterized by many broad, rounded uplands cut by long, linear valleys. The bedrock, which is largely covered by glacial deposits, consists of a variety of sandstones, siltstones, and shales, as well as some conglomerates and coal.

Watersheds

The streams in Beaver County are part of the Ohio River drainage basin (Figure 2). A watershed is defined by the local topography that dictates which way water will flow to the lowest point in an area. The water moves through a network of drainage pathways, both underground and on the surface. Generally, these pathways converge into streams and rivers, which become progressively larger as the water moves downstream, eventually reaching an estuary where the Mississippi reaches the Gulf of Mexico. Watersheds can be large, like that of the Ohio River, or small like that of the Raccoon Creek, but all land is part of a watershed.

Every stream, tributary, and river has an associated watershed, with small watersheds merging to become larger watersheds. Floodplains are flat, often flooded, areas along streams and rivers. They are important terrestrial habitat areas tied to the flowing water system. Floodplains are typically inundated by water during the spring runoff and then remain dry after these floodwaters recede. The effects of water on these systems influence the vegetation communities that can persist there. These forested floodplains also serve as a protective buffer against erosion, provide cooling shade to the waterway, filter pollutants and excessive nutrients from runoff, and help alleviate flood damage along many of the area's creeks.

In addition to naturally vegetated floodplains, vegetated riparian buffers along streams and other bodies of water provide vital benefits including protection of water quality, reduced erosion, flood control, and wildlife habitat. Elimination of riparian vegetation removes the capacity of this region to buffer the effects of the surrounding landscape and consequently reduces the water quality in the stream. Two major effects of the loss of riparian buffers are sedimentation and nutrient enrichment.

Streams that are dammed have modified habitats because of increased water temperatures and changes in the way sediment moves and is distributed in the river. Dams also act as barriers to fish migration. Protecting the quality and purity of surface and groundwater resources from degradation contributes to the future well-being of all plants and animals including human communities.

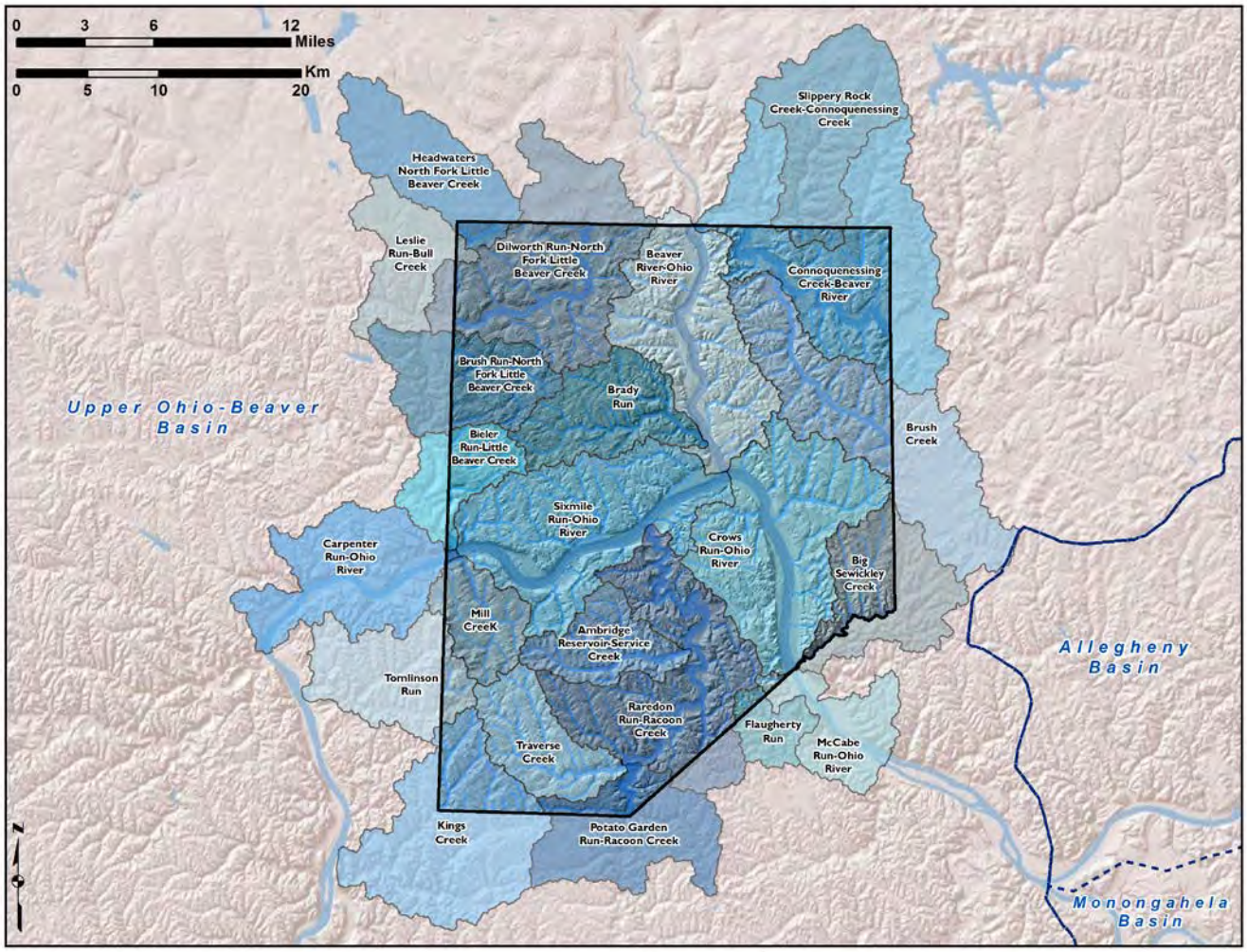


Figure 2. Twelve-digit (HUC12) watersheds in Beaver County. All of the land in Beaver County flows into the Ohio River basin.

Natural Communities

The interaction of geology and climate produces several critical functions in the landscape including the regulation of biogeochemical cycles (water, carbon, and nitrogen), soil formation, and ultimately wildlife habitat. The classification of plant communities typically revolves around the dominant species, habitat, and growth form. Boundaries between community types in the field are often gradual and indistinct.

The vegetation of Beaver County reflects the environmental conditions (e.g., geology, topography, soils, and climate) associated with the physiographic sections, and disturbance history, both natural and anthropogenic. The Mixed Oak Forest Region (Monk et al., 1990) is the major forest cover in Beaver County. This region extends from northern Georgia to southern New England and encompasses the three physiographic provinces that fall within the county. The Mixed Oak Forest was formerly called the Oak-Chestnut region (Braun 1950). However, the introduction of the chestnut blight in 1904 obliterated a dominant species of the forest-type.

Little to none of the original forest cover still exists in Beaver County. Much of the forest on the valley floors was cleared for agriculture and development and the forests that remain have been logged one or more times for fuel and lumber (Keever 1972). These factors have changed the extent and species composition of the forest. For example, the tulip poplar was considered to be a minor component of this forest region but has now become a co-dominant with the oaks in many places. Species composition in the understory has shifted as well with native spicebush and viburnums becoming more dominant in some areas and exotic species such as Japanese honeysuckle, tree-of-heaven, common privet, bush honeysuckles, autumn olive, winged euonymus, Japanese stilt grass, and garlic mustard becoming established in other areas. In many woodlands, these exotics tend to crowd out the native species and reduce the overall biological diversity of the flora. In turn, this reduction in the diversity of the flora also leads to a reduced fauna.

Although the original forest is gone, there are still plant communities that reflect the patterns of the forest that were prevalent in the county. These plant communities occur in response to variations in local climate, topographic position and exposure, bedrock, soils, and hydrology.

The hills within the county are often covered with a mix of oak, tulip poplar, black birch, and maple with varying amounts of beech and hickory. Viburnum species are prevalent shrub components. The cooler north-facing slopes and ravines are often distinctive because they are dominated by hemlock and white pine. White oak, red maple, and beech are also common canopy species.

Two notable but limited plant communities within the county are the floodplain forests and wetlands. The floodplain forests were best developed along the major creeks and rivers, but only remnants still exist. Sycamore, maples, red oak, and pin oak are common tree components. Because of variations in microtopography, a wide assortment of shrubs and herbs may be found in the least disturbed examples of this community. Wetlands are scattered throughout the county and range from wooded with red maple as the dominant tree to marshes with cattails to wet meadows with a variety of grasses and sedges. The type of wetland depends on disturbance, soils, and hydrology (depth and length of time of flooding).

Regional Disturbances

Disturbances, whether natural or man-made, have played a key role in shaping many of the region's natural communities and their associated species. The frequency and scale of these disturbances is formative in the appearance of natural communities today.

Natural Disturbances – Natural disturbances, such as fire and flooding, can actually benefit certain natural communities and species. Periodic fires are needed to maintain grassland openings, allow new growth of the characteristic species, and keep out other successional species. Floodplain forests benefit from the periodic scouring and deposition of sediments as streams overtop their banks. At the same time, streamside wetland communities retain excess water, thus reducing the scale of downstream flooding.

Over-browsing by deer is another natural disturbance which can have detrimental effects on natural communities and species (Rhoads and Klein 1993; Latham et al. 2005). Excessive deer browse can remove the understory of some forests and halt regeneration of the canopy and understory by preferential feeding. Deer feeding preferences can have a direct effect on rare plants and severely decrease essential habitat for other animal species. Over-browsing can result in a lack of forest regeneration, a reduction in the diversity and density of forest understory, a decrease in songbird diversity and direct loss of rare plants (Yahner 1995).

Human Disturbances – Human and natural disturbances create different habitats in different scenarios, but human disturbances often leave the most lasting effect on the environment. Many human disturbances can be beneficial to a specific suite of species that require an early successional habitat. However, what is beneficial to one species is often detrimental to many other species. Many once common species have become rare because they are unable to adapt to disturbance of their small, specialized part of the environment. Consequently, many species have declined due to human alteration of the landscape. Human disturbances are semi-permanent parts of the landscape, but decisions about the type, timing, location, and extent of future disturbances are important to the natural ecological diversity that remains.

Forest Fragmentation

Prior to European settlement, forest covered more than 90 percent of the area that became Pennsylvania (Goodrich et al., 2003). Today 62 percent of the state is forested, comprising an area of over 17 million acres (Figure 3a; Goodrich et al., 2003; Myers et al., 2000). Figure 3b shows the division of these forests by major fragmenting features such as interstate highways and major rivers; however, much of this forest exists as relatively small islands isolated by surrounding linear features such as roads, utility rights-of-way, all-terrain vehicle trails, snowmobile trails, railroads, and patches of non-forested lands. Figure 3c shows forested areas greater than 25 acres that remain after fragmentation by interstates and highways, state and local roads, public forest roads, utility rights-of-way, and active railroads. These forest blocks represent potential contiguous habitat for animals sensitive to all scales of fragmenting features, such as amphibians and interior forest birds. The forest blocks of the county are presented in Figure 4.

Fragmentation of contiguous forested landscapes into smaller, isolated tracts has an effect on plant and animal distribution and community composition. When a large piece of forest tract is fragmented, or split into pieces, the resulting forest islands may lack some of the habitats that existed in the original tract, or may be smaller than the minimum area required by a given species (Lynch and Whigham, 1984). For example, the Louisiana waterthrush (*Parkesia motacilla*) is rarely found in small woodlots because they require upland forest streams within their territory and most small woodlots lack this necessary component (Robbins, 1980; Robinson, et al., 1995). Area-sensitive species such as the northern goshawk (*Accipiter gentilis*), barred owl (*Strix varia*), bobcat (*Lynx rufus*), and timber rattlesnake (*Crotalus horridus*) require interior forest areas in excess of 6,000 acres to accommodate breeding and foraging territories (Ciszek, 2002; Mazur and James, 2000; Squires and Reynolds, 1997).

Edge forest is composed of a zone of altered microclimate and contrasting community structure distinct from the interior or core forest (Matlack, 1993). Along with a reduction in total forested area, forest fragmentation creates a suite of edge effects which can extend 1,000 feet into the remaining fragment (Forman and Deblinger, 2000). Edge effects include increased light intensity, reduced depth of the leaf-litter layer, altered plant and insect abundance,

reduced numbers of macroinvertebrates, and fewer species of macroinvertebrates (Haskell, 2000; Watkins et al., 2003; Yahner, 2000). The macroinvertebrates in the leaf litter are significant for the pivotal role they play in energy and nutrient cycling; these macroinvertebrates also provide a food source for salamanders and ground-feeding birds (Voshell, 2002). Additionally, a number of studies have shown that the nesting success of forest-interior songbirds is lower near forest edges than in the interior, due to increased densities of nest predators and brood parasites.

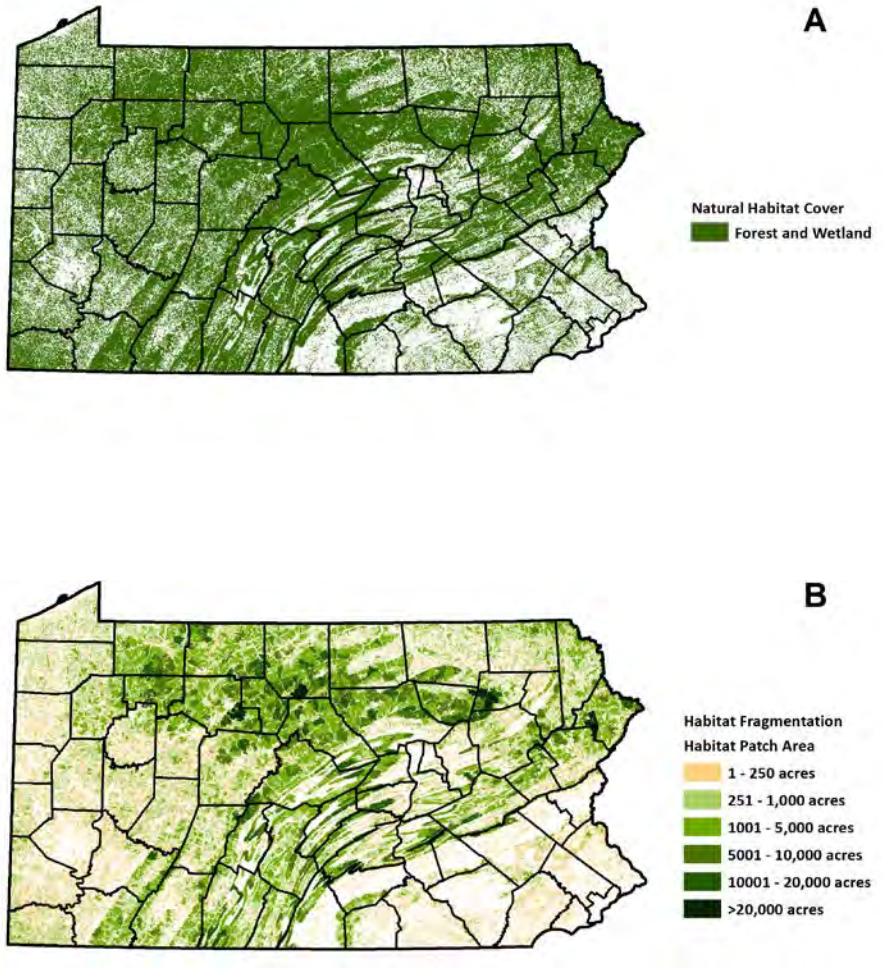


Figure 3. Forest and wetland areas of Pennsylvania shown at varying scales of fragmentation due to human-created linear landscape features.
A. Forest and wetland areas in Pennsylvania derived from the National Land Cover Data Set for Pennsylvania (USGS 2003).
B. Forest and wetland areas greater than one acre, fragmented by interstate, US, and state highways, state and local roads, public forest roads, and active railroads. These habitat blocks represent potential contiguous habitat for animals sensitive to all scales of fragmenting features, such as forest interior birds and amphibians.

Not only do roads fragment forests, but roads can also act as corridors for dispersal of invasive plants and toxic chemicals, and pollute nearby aquatic systems (Forman and Alexander, 1998; Trombulak and Frissell, 2000; Watkins et al., 2003; Williams, 1995). Vehicles can transport exotic plant seeds into previously un-infested areas, while road construction and maintenance operations provide sites for seed germination and seedling establishment (Schmidt, 1989; Trombulak and Frissell, 2000). Road traffic and maintenance of rights-of-way also contribute to the introduction of at least six different kinds of chemicals to the environment: heavy metals, salt, organic pollutants, ozone, nutrients, and herbicides (Forman and Alexander, 1998; Trombulak and Frissell, 2000). Heavy metals such as lead, aluminum, and iron contaminate soils, plants, invertebrates, and vertebrates up to 656 feet from roads (Trombulak and Frissell, 2000). Deicing salts alter the soil's chemical composition (including the pH), which affects plant growth (Forman and Alexander, 1998; Trombulak and Frissell, 2000). Airborne sodium chloride from snowplowing may cause leaf injury to trees up to almost 400 feet from a road (Forman and Alexander, 1998). Organic pollutants such as dioxins and polychlorinated biphenyls (PCBs) are present in higher concentrations along roads, and hydrocarbons may accumulate in aquatic ecosystems near roads. Storm runoff from roads, particularly where roads abut or cross water bodies, can result in the transportation of nutrients and sediments into aquatic ecosystems. Drifting or misused herbicides applied to roadsides and utility rights-of-ways to control woody plant growth may damage forest edge and interior plant species or directly kill rare plants (Williams, 1995).

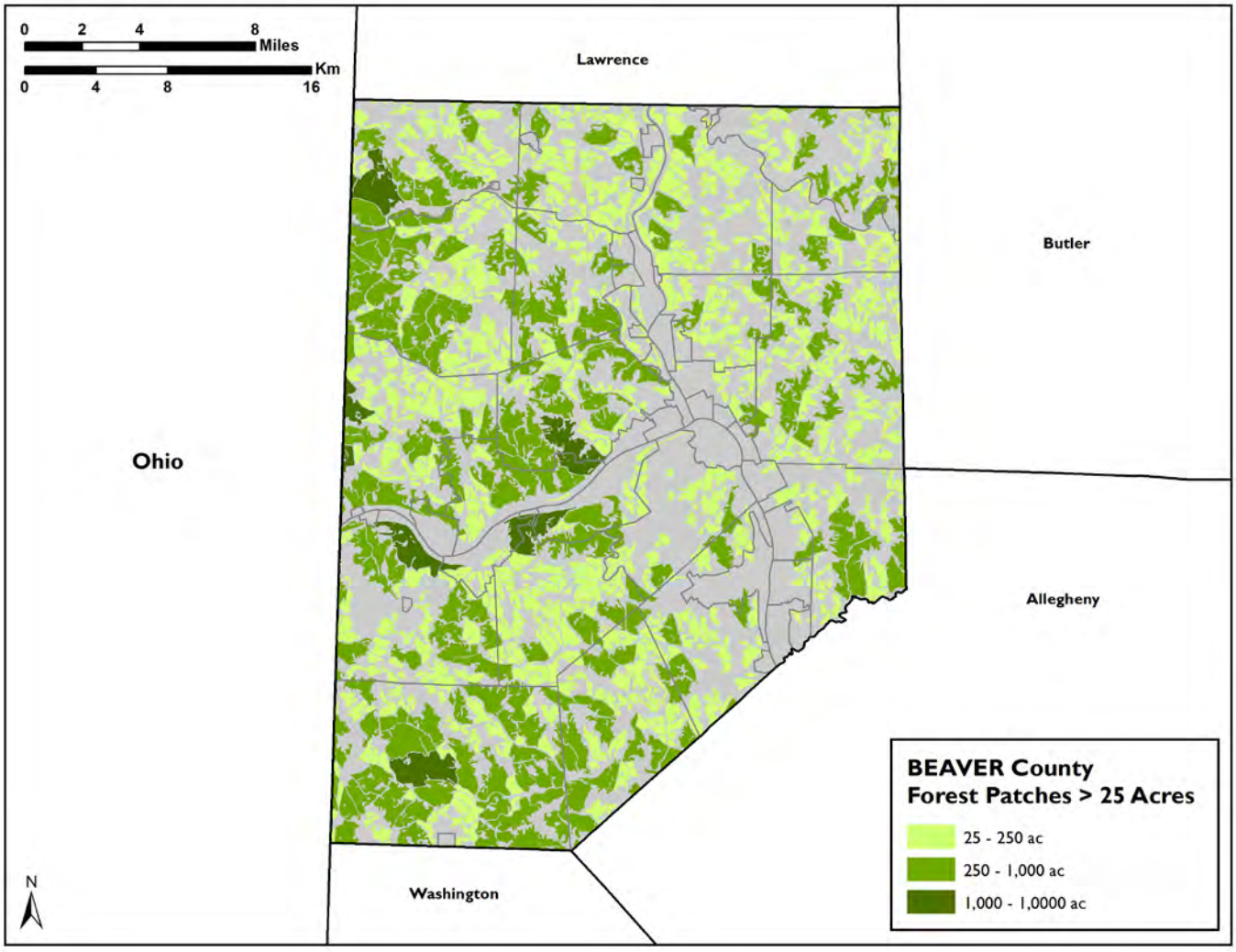


Figure 4. Forest Patches of Beaver County. Many of the larger forest patches lay in the southern and western portions of the county.

Humans function as ecosystem engineers, altering the landscape around us to suit our needs. Some species benefit from human-induced changes, such as birds that inhabit the early successional and edge habitats created by utility corridors, or disturbance-adapted plants that colonize roadsides; however, as is more often the case, species with specific habitat requirements suffer declines when faced with human encroachment. Given the pervasiveness of human influence throughout the northeastern United States, the ecological importance of large areas of relatively pristine habitat cannot be overestimated. Not only are they potential habitat for a number of sensitive species, but they are also important for the maintenance of vital ecosystem processes and services such as nutrient cycling, pollination, predator-prey interactions, and natural disturbances regimes. Additionally, large forested areas also serve to filter and regulate the flows of streams within watersheds and store large quantities of carbon as biomass.

Invasive Species

The introduction of non-native species into Pennsylvania began with the initial European settlement in the 17th century (Thompson 2002) and continues today. Plants and animals have been deliberately introduced for a variety of purposes including food sources, erosion control, landscaping, and game for hunting and fishing. Other species have been accidentally introduced as 'stowaways' through increases in global trade and transportation. These introductions have had drastic effects on Pennsylvania's biodiversity over time. For example, over 37% of the plant species now found in the state did not occur here during the first period of European settlement (Thompson 2002).

Invasive Plants

Invasive plants reproduce rapidly, spread quickly over the landscape, and have few, if any, natural controls such as herbivores and diseases to keep them in check (Table 1). Invasive plants typically have a number of characteristics that allow them to spread rapidly and make them difficult to remove or control:

1) Spreading aggressively by runners or underground roots;
2) Producing large numbers of seeds that survive to germinate;
3) Dispersing seeds away from the parent plant through various means such as wind, water, wildlife, and people.

Invasive plants are capable of displacing native plants from natural communities, especially those with rare, vulnerable, or limited populations. This initial impact is worsened by the tendency for native wildlife to prefer native species over invasive species for food. In some cases, a switch to the invasive plant food supply may affect the physiology of the prey species. For example, many invasive shrubs, such as non-native bush honeysuckles (*Lonicera* spp.), provide fruits that native birds find attractive, yet these fruits do not provide the nutrition and high-fat content the birds need in their diets (Swearingen et al. 2002).

Aggressive invasive plants can also transform a diverse small-scale ecosystem, such as a wetland or meadow, into a monoculture of a single species, drastically reducing the overall plant richness of an area and limiting its ecological value. The decrease in plant biodiversity can, in turn, impact the mammals, birds, and insects in an area, as the invasive plants do not provide the same food and cover value as the natural native plant species did (Swearingen et al., 2002).

Invasive Animal Species

In addition to invasive plants, Pennsylvania is now home to several exotic species of animals including mammals, birds, fish, and reptiles along with a suite of invertebrates, fungi, and bacteria. These species can directly threaten populations of native animals through direct competition or predation. Other invasive exotic animals can alter habitats and ecosystems by changing plant cover or diversity.

Chestnut blight (*Cryphonectria parasitica*), a fungus, was probably introduced to North America from infected nursery stock from China in the 1890s. First detected in New York City in 1904, it has all but wiped out the American chestnut (*Castanea dentata*) from Maine to Alabama to the Mississippi River. American chestnut once comprised one-fourth to one-half of eastern U.S. forests and was prized as a food for humans, livestock, and wildlife and for its beautiful and durable wood. Today, only stump sprouts from killed trees remain and the canopy composition has been filled by the chestnut's associate species of oaks and hickories.

Emerald ash borer (*Agrilus planipennis*) is a beetle that kills all species of ash trees (*Fraxinus* spp.) Accidentally introduced into North America from Asia in 2002, it was first detected in Pennsylvania in 2007 in Beaver County and has spread rapidly across the state since then. It is expected that in coming years ash trees will be functionally extirpated in Pennsylvania.

Another introduced tree-killing species is the hemlock woolly adelgid (*Adelges tsugae*). This is a small aphid-like insect that feeds on the leaves of eastern hemlock trees (*Tsuga canadensis*). Infestations of the woolly adelgid appear

as whitish fluffy clumps of feeding adults and eggs along the underside of the branch tips of the hemlock. Hemlock decline and mortality typically occurs within four to ten years of initial infestation. The adelgid can cause up to 90% mortality in eastern hemlocks, which are important for shading trout streams, and provide habitat for about 90 species of birds and mammals, some exclusively. Several control options are currently being tested, but these have met with very limited success. It is currently distributed from Maine to Georgia and can be found in most of the counties in Pennsylvania (DCNR 2007). Its presence in Beaver County was confirmed in 2007.

photo source: Connecticut Agricultural Experiment Station Archive

Hemlock woolly adelgid infestation along a hemlock branch.

The gypsy moth (*Lymantria dispar*) has caused extensive defoliation of forests in the northeast. This European moth was intentionally introduced to the U.S. in 1869 as part of a failed commercial silk production venture. Its main impact is that it defoliates trees, concentrating on oak species, but opportunistically eating almost any type of plant. This defoliation can result in a reduction in the growth rate and eventual death of afflicted trees.

Several invasive animal species are spreading throughout the streams, rivers, and lakes of Pennsylvania, but in many cases the impact of these species remains unknown. The zebra mussel (*Dreissena polymorpha*) was accidentally introduced to the Great Lakes in the 1980s and has been spreading in Pennsylvania's waters. This mussel poses a great threat to industry, recreation, and native fish and mussel species and should be controlled wherever it occurs. Another non-native bivalve, the Asian clam (*Corbicula fluminea*), has spread throughout most of Pennsylvania's waterways including the Susquehanna and its tributaries. Of greatest concern to biodiversity is the capacity of the clam to alter the ecology of aquatic systems, making it less hospitable to the native assemblage of freshwater mussels, fish, invertebrates, and plants. Another aquatic species found in the region, the rusty crayfish (*Orconectes rusticus*), has been transplanted from its native range in the midwestern United States to many of Pennsylvania's watersheds in the form of live fishing bait even though it is prohibited from transport by the state. Potentially, rusty crayfish can reproduce in large numbers and reduce lake and stream vegetation, depriving native fish and their prey of cover and food. Their size and aggressive nature keep many fish species from feeding on them. Rusty crayfish may also reduce native crayfish, freshwater mussels, and reptile and amphibian populations by out-competing them for food and habitat or by preying directly on young individuals.

Overall Invasive Recommendations

The spread of invasive species within the region presents a significant hurdle to the reestablishment of native plants and animals. Additionally, new invasive species continue to be introduced, further degrading natural habitat and displacing native species. This continuous disturbance from invasive species mandates their active management for any native vegetation restoration plan to be successful.

Successful control of invasive species is a time-, labor-, and resource-intensive process, but it is also necessary for native areas to survive. Prevention or control during the early stages of an infestation is the best strategy. In areas where invasive plants are well established, multiple control strategies and follow-up treatments may be necessary. After the infestation has been eliminated, regular "maintenance" of the site to prevent a new infestation may also be needed. Specific treatment depends on the target species' biological characteristics and population size. Invasive plants can be controlled using biological, mechanical, and/or chemical methods.

Table 1. Significant invasive plant species with colonization potential in Beaver County.

Species	Description and Threat
Japanese plumegrass (*Miscanthus sinensis*) Bamboo (*Pseudosasa* spp.) Common reed (*Phragmites australis*)	These large grasses spread through runners and/or wind-blown seeds. They are highly invasive and quickly form large monocultures that offer little habitat to native species.
European alder (*Alnus glutinosa*) Japanese angelica-tree (*Aralia elata)* Japanese barberry (*Berberis thunbergii*) Butterfly bush (*Buddleja* sp.) Burning bush (*Euonymus alatus*) Privet (*Ligustrum* spp.) White mulberry (*Morus alba*) Bradford pear (*Pyrus calleryana*) Jetbead (*Rhodotypos scandens*) Wineberry (*Rubus phoenicolasius*) Japanese Spiraea (*Spiraea japonica*)	Many of these commonly used landscape shrubs have escaped from cultivation to form dense thickets that displace native woody and herbaceous plants.
Garlic mustard (*Alliaria petiolata*) Chervil (*Anthriscus sylvestris*) Crown vetch (*Coronilla varia)* Japanese stiltgrass (*Microstegium vimineum*) Lesser celandine (*Ranunculus ficaria*)	These increasingly common invasive herbs are spreading through natural areas throughout the region often forming large patches that can prevent native species regeneration.
Purple loosestrife (*Lythrum salicaria*) Japanese and giant knotweed (*Polygonum cuspidatum* and *P. sachalinense*)	These fast-growing exotics displace natural vegetation, greatly alter natural ecosystems, and degrade riparian systems throughout the state. Once established in a wetland these species are difficult to eradicate and will displace native species.
Five-leaved akebia (*Akebia quinata)* Porcelain berry (*Ampelopsis brevipedunculata*) Oriental bittersweet (*Celastrus orbiculatus*) Wintercreeper (*Euonymus fortunei*) English ivy (*Hedera helix*) Japanese hops (*Humulus japonicus*) Japanese honeysuckle (*Lonicera japonica*) Periwinkle (*Vinca minor*) Exotic wisterias (*Wisteria sinensis & W. floribunda*)	These perennial vines cover and out-compete native vegetation as well as girdle trees by twining up them. They are noted for devastating unmanaged trees and shrubs by smothering the plants and often form an impenetrable barrier along forest and stream edges. Additionally, Japanese hops and English ivy are noted for causing skin rashes.
Mile-a-minute (*Polygonum perfoliatum*)	An annual vine that invades open and disturbed areas and scrambles over native vegetation, smothering them.
Autumn olive (*Elaeagnus umbellata*) Non-native bush honeysuckles (*Lonicera tatarica, L. morrowii, L. maackii*, and *L. xylosteum*), Glossy buckthorn (*Rhamnus frangula*) Multiflora rose (*Rosa multiflora*)	Found in a variety of environments from wetlands to uplands. These compete with native plants for moisture, nutrients, and pollinators. Fruits do not provide high-energy food for migrating birds.
Non-native viburnums (*Viburnum plicatum, V. sieboldii, V. dilatatum*)	Shrubs or small trees that supplant native viburnum species. Commonly used in landscaping, the berries of viburnums attract birds allowing quick and widespread invasion.
Norway maple (*Acer platanoides*) Sycamore maple *(Acer pseudoplatanus)* Tree-of-heaven (*Ailanthus altissima*) Princess tree (*Paulownia tomentosa*) Bird cherry (*Prunus avium)* Siberian elm *(Ulmus pumila)*	These fast growing introduced trees are still sold as ornamental trees. They have spread throughout Pennsylvania invading many rich upland woodlands and are commonly found along roadsides.

METHODS

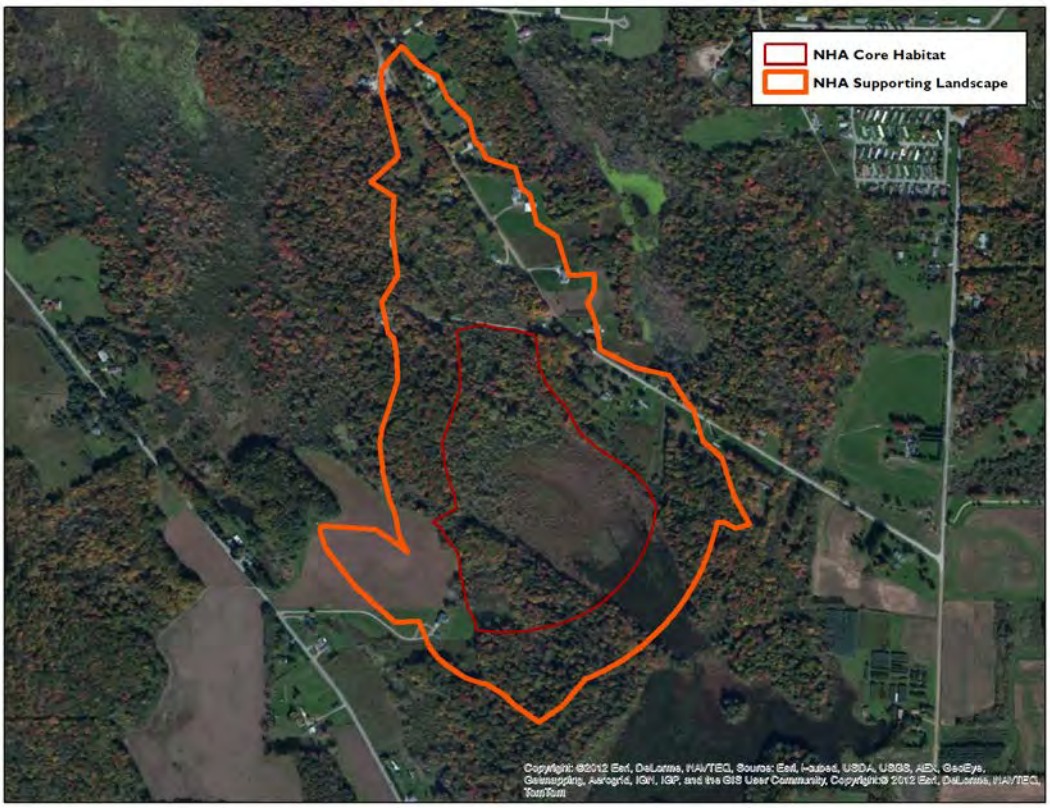
The following are an overview of the general methods used to create this report. For more detail about any of these methods, please contact the Pennsylvania Natural Heritage Program.

Mapping Of Natural Heritage Areas (NHAs)

A Natural Heritage Area (NHA) is an area containing one or more plant or animal species of concern at state or federal levels, exemplary natural communities, or exceptional native biological diversity. NHAs include both the immediate habitat and surrounding lands important in the support of these elements. They are mapped according to their sensitivity to human activities, with designations of Core Habitat and Supporting Landscape areas. The sensitivity of each designation varies significantly according to the particular plant, animal, or natural community habitat that the area represents and is discussed in detail in each NHA Site Description.

Core Habitat – areas representing critical habitat that cannot absorb significant levels of activity without substantial negative impacts to elements of concern.

Supporting Landscape – areas directly connected to Core Habitat that maintain vital ecological processes and/or secondary habitat that may be able to withstand some lower level of activity without substantial negative impacts to elements of concern.



Data obtained on species of concern and natural communities during the field work for this inventory was combined with existing data on species of concern and exemplary natural communities in the PNHP database back to 50 years before present and summarized. Plant and animal nomenclatures follow those adopted by the Pennsylvania Biological Survey. Natural community descriptions follow Zimmerman *et al.* (2012), which is a revision of Fike (1999). All sites with rare species and/or natural communities were selected for inclusion in Natural Heritage Areas (NHAs; see definition below).

Spatial data on the elements of concern were compiled in a Geographic Information System (ESRI ArcGIS 10). Boundaries defining Core Habitat and Supporting Landscapes for each species or community of concern were

delineated using PNHP specifications for Conservation Planning Polygons (CPPs) for the elements of concern. These specifications are based on scientific literature and expert knowledge for individual species or animal assemblages and may incorporate physical factors (e.g., slope, aspect, hydrology); ecological factors (e.g., species composition, disturbance regime); or input provided by jurisdictional government agencies. Core Habitat and Supporting Landscapes for each NHA are then delineated based on the CPPs. NHAs may represent a combination of CPPs for multiple species and populations or they may represent critical habitat defined by a CPP for just one element of biodiversity. NHAs are mapped without regard to political boundaries, and can extend across property boundaries onto un-surveyed lands. NHA boundaries vary in size and extent depending on the physical characteristics of a given site and the ecological requirements of its unique natural elements. For instance, two Core Habitat wetlands of the same size occurring in the same region may require Supporting Landscape areas of very different size and shape to support their functions if one receives mostly ground water and the other receives mostly surface water, or if one supports a plant species of concern, while the other supports a bird species of concern. Each NHA is then assigned a significance rank based on its importance, ecological integrity, and contribution to biological diversity across the state. These ranks can be used to help prioritize future conservation efforts.

Mapping and Conservation Planning for Sensitive Species

As some data that PNHP collects is considered sensitive, due to threats to the species from collection or other harm, the program has adopted the following general guidelines regarding the release of natural heritage information:

- The discretionary release of PNHP information should help conserve the species, habitat, or site in question.
- Non-sensitive information will be made broadly available, while the distribution of sensitive information will be restricted.
- Sensitive information is defined as location information for species identified by the appropriate jurisdictional agency as collectible, having economic value, or being susceptible to decline as a result of visitation. Sensitive species in Beaver County are identified in Table 2, but these species are not mentioned by name in NHA descriptions.
- The release of sensitive information as defined above (1) will be considered on a case-by-case basis, (2) will be limited to those with a demonstrated need to know, and (3) will require a signed information sharing agreement. The decision to release the information will be made by the agency having jurisdiction over the species in question. Valid reasons for releasing sensitive information could include, but are not be limited to, environmental review, research, and conservation planning. The information sharing agreement will define restrictions on how the information can be used and limit further distribution or sharing.
- Information that is not considered sensitive will be made available as supporting habitat conservation-planning polygons and will include the name of the species or community present. Requests for more detailed information will be considered on a need-to-know basis and will require an information sharing agreement.

Spatial representation for these sensitive species will be consistent with PNHP data sharing guidelines outlined above. These are presented as large, statewide level sites which will contain a single polygon feature for a given area that matches merged overlapping CPP Supporting Landscapes for the sensitive species. In some cases this will equate to a range map for the species, and in others, it may be a series of adjacent large forest patches. The scale of these matches the scale at which jurisdictional agencies are comfortable allowing species information to be released. These will sufficiently obscure the precise locations of sensitive species occurrences.

Conservation planning information will follow a similar format as all other NHA Site Accounts and will include a description of the species present, habitat needs, general threats and stresses, and conservation recommendations. This information will not be specific to a particular occurrence, but rather it will provide guidance for users of the data to have a general awareness of the taxa and to be able to use the information in project planning and broad-scale conservation efforts.

Site Accounts

An account describing the site and outlining the conservation priorities, threats and stresses, and conservation recommendations is presented for each NHA. Each site account includes a table listing the species tracked by PNHP documented at that site. This table includes the species common and scientific names. A species listed as a "Sensitive Species of Concern" is unnamed by request of the jurisdictional agency responsible for its protection, due to factors such as illegal collection, intentional destruction, or potential to be disturbed by people. Additional information noted in the table includes PNHP element ranks, State Status, quality rank and the last year this species was officially observed (see below). Site accounts are designed to be shared with interested individuals and potential users, and are available to the public via the PNHP website at http://www.naturalheritage.state.pa.us/. Conservation Rank information is also presented in tables for each NHA and a basic of overview of field values is presented below.

PNHP Element Ranks

Determining which species and ecosystems are thriving and which are rare or declining is crucial for targeting conservation efforts toward elements of biodiversity in greatest need. NatureServe and its member programs use a suite of factors to assess the conservation status of plant and animal species, as well as ecological communities and systems. These assessments lead to the designation of a PNHP element rank. For species, these ranks provide an estimate of extinction risk, and for ecological communities and systems they provide an estimate of the risk of elimination. The decisions regarding PNHP rank and status are made by a state-recognized panel of experts of the Pennsylvania Biological Survey, following NatureServe guidelines.

The PNHP element rank of each species or ecosystem is identified by a number from 1 to 5 proceeded by a letter reflecting the appropriate geographic scale of the assessment (G = Global and S = Subnational). The numbers have the following meaning:

1 = Critically Imperiled: at very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
2 = Imperiled: at high risk of extinction or elimination due to very restricted range, very few populations, steep declines, or other factors.
3 = Vulnerable: at moderate risk of extinction or elimination due to a restricted range, relatively few populations, recent and widespread declines, or other factors.
4 = Apparently Secure: uncommon but not rare; some cause for long-term concern due to declines or other factors.
5 = Secure: common; widespread and abundant.

For example, G1 would indicate that a species is critically imperiled across its entire range (i.e., globally). In this example, the species as a whole is regarded as being at very high risk of extinction. A rank of S3 would indicate the species is vulnerable and at moderate risk within a particular state or province, even though it may be more secure elsewhere.

Species and ecosystems are designated with either an "X" (presumed extinct or extirpated)if there is no expectation that they still survive, or an "H" (possibly extinct or extirpated)if they are known only from historical records but there is a chance they may still exist. Other variants and qualifiers are used to add information or indicate any range of uncertainty. Additional information regarding PNHP element rank definitions, as well as complete descriptions of ranks and qualifiers can be found at http://www.naturalheritage.state.pa.us/RankStatusDef.aspx
or http://www.natureserve.org/explorer/ranking.htm.

PNHP typically tracks all species ranked S1-S3 in Pennsylvania. Some less-rare species are also tracked if they are thought to be of conservation concern. Still other species are actually rare, but due to a lack of scientific information, they are not yet ranked and recognized as rare.

Federal and State Status

Federally listed species are under the jurisdiction of the US Fish and Wildlife Service and have the following status definition:

- LE = Listed Endangered: a species which is in danger of extinction throughout all or a significant portion of its range.
- LT = Listed Threatened: any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

The three state jurisdictional agencies (DCNR, PGC, and PFBC) each have slightly different definitions that define status ranks of species under their jurisdiction. Therefore, for the purposes of this report, the following general definitions are used to indicate the degree of rarity of each species.

- PE = Pennsylvania Endangered: species in imminent danger of extinction or extirpation throughout their range in Pennsylvania if the deleterious factors affecting them continue to operate.
- PT = Pennsylvania Threatened: species that may become endangered within the foreseeable future throughout their range in Pennsylvania unless the casual factors affecting the organism are abated.
- N = No Status – no current legal status, but the species is under study for listing consideration in the future.

Please refer to http://www.naturalheritage.state.pa.us/RankStatusDef.aspx for a precise and expanded list of Federal and State Status definitions.

Quality Ranks

Each population of a species of concern is assigned a quality rank, based on the estimated probability that it will persist over time. The most commonly assigned ranks are summarized below:

- A: Excellent Viability – very likely to persist for 20-30 years in current condition or better.
- B: Good Viability – likely to persist for 20-30 years in current condition or better.
- C: Fair Viability – persistence uncertain, or decline in condition likely over 20-30 years.
- D: Poor Viability – very high risk of extirpation.
- E: Verified Extant – recently verified as still existing, but without enough information to estimate viability.
- H: Historical – recent field information is lacking, but might still be present
- F: Failed to Find – recent field surveys have failed to locate the species, but habitat still exists and there is a possibility of persistence.
- X: Extirpated – surveys demonstrate persuasively that the species is no longer present.

Combination ranks (such as AB or CD) are used to indicate a range of uncertainty associated with a population's viability. Please refer to http://www.natureserve.org/explorer/eorankguide.htm for expanded definitions and application of quality ranks.

Site Ranking

Each Natural Heritage Area is assigned a significance rank that represents the site's biodiversity importance. Ranks are calculated by a score that represents the G-ranks and S-ranks of each species present at the site, weighted by the Quality ranks for those populations. These scores are summed for each site to produce an overall site score. These scores were used to guide the ranking of the site by expert review. Site scores are assigned categorical ranks based on score thresholds and criteria defined by PNHP biologists.

Rank	Description
Global	Sites which have global importance for biological diversity and Pennsylvania has a primary role to maintain (e.g., most of the known occurrences are within Pennsylvania). Sites in this category generally contain one or more occurrences of species of global concern (e.g., G2 and G1) or large concentrations of species of lower significance.
Regional	Sites which have regional importance for biological diversity and these Pennsylvania sites are important for maintaining representation of those species in the greater Northeast /mid-Atlantic region. Sites in this category generally contain one or more occurrences of species of global concern (e.g., G3) or concentrations of species of lower significance.
State	Sites which are important for the biological diversity and ecological integrity at the state scale. Sites have occurrences of elements of concern with lower ranks (G and S rank see above), smaller populations or extent, or generally lower biodiversity scores than Global or Regional ranked areas.
Local	Sites which have importance to biological diversity at the county scale, but are not, as yet, known to contain species of concern or state significant natural communities. Often recognized because of their relative size, undisturbed character, or proximity to areas of known significance, these sites may be targeted with future surveys.

RESULTS

To update this County Natural Heritage Inventory, the botanists, ecologists, and zoologists of the Pennsylvania Natural Heritage Program, and partner organizations, have explored the natural resources of Beaver County. This work represents an organized effort to inventory the biodiversity present throughout the county. Some of the earliest formal natural history study in this area was completed in the early part of the 19th century. These early explorers provided records that, whenever possible, have been updated in this report. In the surveys conducted for this inventory, researchers have not only identified rare, threatened, and endangered plants and animals, but also many common species, for which no formal records previously existed in museum and agency records.

Species and Communities of Concern in Beaver County

Seventy species and natural communities of concern were documented in Beaver County for this report (Table 2). Many of these have multiple occurrences across several Natural Heritage Areas across the county. Factsheets describing habitats, threats, and conservation recommendations for many of these species may be found on the PNHP website at http://www.naturalheritage.state.pa.us/ under Species Lists. Species names followed by an asterisk are sensitive species, which are not identified at the site level.

Table 2. Species and Natural Communities of Concern in Beaver County.

Species Common Name (*Scientific Name*)	Global Rank	State Rank	PA Legal Status
Mammals			
Indiana Bat (*Myotis sodalis*)*	G2	SUB,S1N	Federally Endangered PE (PE)
Amphibians			
Four-toed Salamander (*Hemidactylium scutatum*)*	G5	S4	N (N)
Reptiles			
Queen Snake (*Regina septemvittata*)*	G5	S3	N (N)
Smooth Green Snake (*Liochlorophis vernalis*)*	G5	S3S4	N (N)
Wood Turtle (*Glyptemmys insculpta*)*	G3	S3S4	N (N)
Eastern Box Turtle (*Terrapene carolina carolina*)*	G5	S3S4	N (N)
Birds			
Great Blue Heron (*Ardea herodias*) rookery*	G5	S3S4B,S4N	N (N)
Peregrine Falcon (*Falco peregrinus*)	G4	S1B,S1N	PE (PE)
Bald Eagle (*Haliaeetus leucocephalus*)*	G5	S3B	DL (PT)
Osprey (*Pandion haliaetus*)	G5	S3B	PT (PT)
Pied-billed Grebe (*Podilymbus podiceps*)	G5	S3B,S4N	N (CR)
Prothonotary Warbler (*Protonotaria citrea*)	G5	S2S3B	N (CR)
Fishes			
Skipjack Herring (*Alosa chrysochloris*)	G5	S4	N (DL)
Black Bullhead (*Ameiurus melas*)*	G5	S1	PE (PE)
Bluebreast Darter (*Etheostoma camurum*)	G4	S4	PT (PT)
Smallmouth Buffalo (*Ictiobus bubalus*)	G5	S4	N (DL)
Longnose Gar (*Lepisosteus osseus*)	G5	S4S5	N (DL)
Longear Sunfish (*Lepomis megalotis*)*	G5	S1	PE (PE)
Silver Chub (*Macrhybopsis storeriana*)	G5	S3S4	N (DL)

River Redhorse (*Moxostoma carinatum*)	G4	S3S4	N (DL)
Channel Darter (*Percina copelandi*)	G4	S4	N (DL)
Southern Redbelly Dace (*Phoxinus erythrogaster*)*	G5	S1	PT (PT)
Mussels			
Three-ridge Mussel (*Amblema plicata*)	G5	S2S3	N (PT)
Flat Floater (*Anodonta suborbiculata*)	G5	S1	N (N)
Cylindrical Papershell (*Anodontoides ferussacianus*)	G5	S2S3	N (CR)
Fragile Papershell (*Leptodea fragilis*)	G5	S2	N (CR)
Threehorn Wartyback (*Obliquaria reflexa*)	G5	SH	N (PX)
Round Pigtoe (*Pleurobema sintoxia*)	G4G5	S2	N (PE)
Pink Heelsplitter (*Potamilus alatus*)	G5	S2	N (CR)
Mapleleaf (*Quadrula quadrula*)	G5	S1S2	N (PT)
Fawnsfoot (*Truncilla donaciformis*)*	G5	S1	N (CU)
Paper Pondshell (*Utterbackia imbecillis*)	G5	S3S4	N (CU)
Rainbow Mussel (*Villosa iris*)	G5Q	S1	N (PE)
Butterflies and Moths			
Falcate Orangetip (*Anthocharis midea*)	G4G5	S3	N (N)
Pipevine Swallowtail (*Battus philenor*)	G5	S3	N (N)
Silvery checkerspot (*Chlosyne nycteis*)	G5	S3S4	N (N)
Harvester (*Feniseca tarquinius*)	G4	S3	N (N)
Leonard's Skipper (*Hesperia leonardus*)	G4	S3	N (N)
West Virginia White (*Pieris virginiensis*)	G3?	S2S3	N (N)
Gray Comma (*Polygonia progne*)	G4G5	S3	N (N)
Coral Hairstreak (*Satyrium titus*)	G4G5	S3	N (N)
Regal Moth (*Citheronia regalis*)	G4G5	SU	N (N)
Shiny Gray Carpet Moth (*Stamnodes gibbicostata*)	G4	SU	N (N)
Dragonflies and Damselflies			
Blue-ringed Dancer (*Argia sedula*)	G5	S1S3	N (N)
Blue-tipped Dancer (*Argia tibialis*)	G5	S2	N (N)
Dusky Dancer (*Argia translata*)	G5	S3S4	N (N)
Azure Bluet (*Enallagma aspersum*)	G5	S3S4	N (N)
Midland Clubtail (*Gomphus fraternus*)	G5	S2S3	N (N)
Russet-tipped Clubtail (*Stylurus plagiatus*)	G5	S1	N (N)
Other Invertebrates			
Blue Crayfish (*Cambarus monongalensis*)	G5	S1S2	N (N)
Plants			
Short-awn Foxtail (*Alopecurus aequalis*)	G5	S3	N (PT)
Puttyroot (*Aplectrum hyemale*)	G5	S3	PR (PR)
Vase-vine Leather-flower (*Clematis viorna*)	G5	S1	PE (PE)
Harbinger-of-spring (*Erigenia bulbosa*)	G5	S4	PT (PR)
White Trout-lily (*Erythronium albidum*)	G5	S3	N (TU)
Golden-seal (*Hydrastis canadensis*)*	G4	S4	PV (PV)
Purple Rocket (*Iodanthus pinnatifidus*)	G5	S1	PE (PE)

Grass-leaved Rush (*Juncus biflorus*)	G5	S2	TU (PT)
Heartleaf Meehania (*Meehania cordata*)	G5	S1	TU (PE)
Wild Ginseng (*Panax quinquefolius*)*	G3G4	S4	PV (PV)
Wild Kidney Bean (*Phaseolus polystachios*)	G5	S1S2	N (PE)
Yellow Water-crowfoot (*Ranunculus flabellaris*)	G5	S2	N (PT)
Meadow Rose (*Rosa blanda*)	G5	SU	N (TU)
Stalked Bulrush (*Scirpus pedicellatus*)	G4	S1	PT (PT)
Rock Skullcap (*Scutellaria saxatilis*)	G3	S1	TU (PE)
Featherbells (*Stenanthium gramineum*)	G4G5	S3	N (PR)
Snow Trillium (*Trillium nivale*)*	G4	S3	PR (PR)
Communities			
Bottomland Oak - Hardwood Palustrine Forest	GNR	S2	N (N)
Silver Maple Floodplain Forest	GNR	S4	N (N)
Sycamore - (River Birch) - Box-Elder Floodplain Forest	GNR	S4	N (N)

Natural Heritage Areas of Beaver County

This inventory of rare species has resulted in the designation of 29 Natural Heritage Areas in Beaver County (Table 3). Both Core Habitat and Supporting Landscape are shown. Brief site descriptions and their significance ranks are presented in Table 3. One of the sites is ranked as having Global Significance, six have Regional Significance, and 22 have State Significance. Criteria for these significance ranks are discussed in more detail in the Methods section of this document.

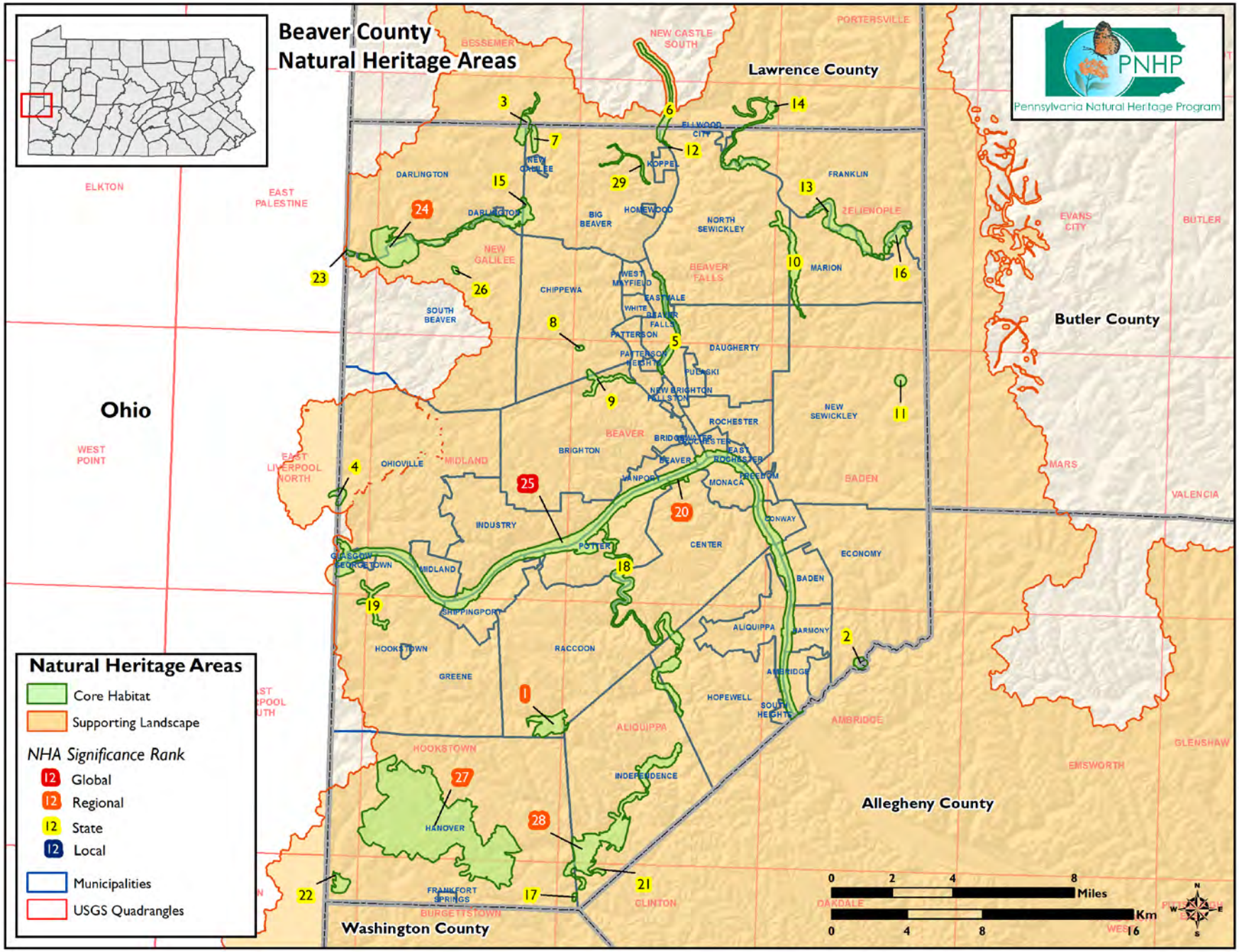

Beaver County
Natural Heritage Areas
PNHP
Pennsylvania Natural Heritage Program
Lawrence County
Butler County
Allegheny County
Washington County
Ohio
Natural Heritage Areas
Core Habitat
Supporting Landscape
NHA Significance Rank
Global
Regional
State
Local
Municipalities
USGS Quadrangles
Miles
Km

Table 3. Natural Heritage Areas categorized by significance. The results of the Natural Heritage Inventory are summarized in order of their ecological significance based on the number and degree of rarity of species they support. Significance ranks are ***Global***, ***Regional***, ***State***, and ***Local***.

NHA #	Site Name	Significance Rank	Brief Description
1	Ambridge Reservoir Valleys	Regional	Forests at this site provide habitat for the globally vulnerable West Virginia white butterfly and a sensitive species of concern.
2	Big Sewickley Creek Woods	State	Forest and aquatic habitats at this site support a sensitive species of concern.
3	Beaver-Lawrence County Line Wetlands	State	Wetlands along the North Fork Little Beaver Creek support several animal species of concern as well as two plant species of concern.
4	Beaver Creek	State	Highly diverse habitat supports a Sycamore - (River Birch) - Box-elder Floodplain Forest natural community and habitat for three animal species of concern.
5	Beaver River at Canal Dam	State	Aquatic habitat on the Beaver River supports a population of the dusky dancer, a damselfly species of concern in Pennsylvania.
6	Beaver River at Rock Point	Regional	This section of the Beaver River supports a number of dragonfly species of concern, including the newly rediscovered elusive clubtail.
7	Big Beaver Boro Wetlands	State	Natural and human-made wetlands provide habitat for azure bluet, a damselfly species of concern.
8	Brady Run Slope	State	Upland forest at Brady Run Slope supports two plant species of concern: featherbells and wild kidney bean.
9	South Branch Brady Run	State	This site supports two sensitive species of concern and the state rare plant, heartleaf meehania.
10	Brush Creek	State	Riparian habitat along Brush Creek supports a sensitive species of concern and a population of blue-tipped dancer, a damselfly species of concern.
11	Upper Brush Creek	State	Forest and aquatic habitats at this site support a sensitive species of concern.
12	Confluence Slope	State	This stretch of slope along the Beaver River supports a population of purple rocket, an endangered plant species in Pennsylvania.
13	Connoquenessing Creek at Camp Kon-O-Kwee	State	Aquatic and riparian habitat along Connoquenessing Creek support several animal species of concern.
14	Connoquenessing Creek at Ellwood City	State	Aquatic and riparian habitat supports populations of two mussels of concern: round pigtoe and three-ridge mussel, and a plant species of concern, purple rocket, as well as a sensitive species of concern.
15	Darlington Swamp and North Fork Little Beaver Creek	State	Riparian habitat along North Fork Little Beaver Creek includes a state rare Bottomland Oak - Hardwood Palustrine Forest and supports several species of concern.
16	Doe Run Woods	State	Forests along this oxbow tributary to Connequenessing Creek support a sensitive species of concern.

NHA #	Site Name	Significance Rank	Brief Description
17	Hanover Slope	State	A forested slope supports a population of vase-vine leather-flower, an endangered plant species in Pennsylvania.
18	Lower Raccoon Creek	State	Aquatic and riparian habitat along Lower Raccoon Creek supports the blue-tipped dancer, a damselfly species of concern, bluebreast darter, a fish species of concern, and one sensitive species of concern.
19	Mill Creek in Beaver County	State	Riparian habitat along Mill Creek supports a population of a sensitive species of concern.
20	Monaca Bluffs	Regional	Forested bluffs overlooking the Ohio River west of Monaca provide habitat for two species of concern, rock skullcap, a globally vulnerable plant, and the pipevine swallowtail.
21	Newman Road Woods	State	Forested habitat supports a sensitive species of concern.
22	North Fork King's Creek	State	This forested stream valley provides habitat for two species of concern.
23	North Fork Little Beaver Creek – State Line	State	This site supports a population of purple rocket, an endangered plant species in Pennsylvania.
24	North Fork Little Beaver Creek at State Game Land 285	Regional	This site provides habitat for white trout-lily, a state rare plant, and a number of animal species of concern.
25	Ohio River in Beaver County	Global	This section of the Ohio River provides aquatic, riparian, and upland habitat for a high diversity of bird, fish, mussel and other invertebrate species of concern.
26	Painter Run	State	Wetland habitat along Painter Run supports a population of grass-leaved rush, a plant species of concern in Pennsylvania.
27	Raccoon Creek State Park	Regional	Diverse habitats support a number of animal species of concern, including several rare butterflies, as well as the state rare plant, featherbells.
28	Raccoon Creek Valley and Wildflower Reserve	Regional	Rich forests, floodplains, and aquatic habitats within the Raccoon Creek State Park's Wildflower Reserve and along Raccoon Creek support many species of concern.
29	Stockman Run	State	Aquatic habitat at this site supports a population of a sensitive species of concern.

Conservation Planning for Indiana Bats

Indiana bats (*Myotis sodalis*) are found throughout most of the eastern United States. Their winter hibernacula can be in limestone caves or abandoned mines. During summer they roost under the peeling bark of dead and dying trees. Indiana bats are quite small, weighing only one-quarter of an ounce, although in flight they have a wingspan of 9 to 11 inches. Their fur is dark-brown to black. Indiana bats eat a variety of flying insects found along rivers or lakes and in uplands.

The 2009 range wide population estimate was about 387,000 Indiana bats, less than half as many as when the species was listed as Federally endangered in 1967.

Charlie Eichelberger, PNHP

Indiana bat (*Myotis sodalis*)

Threats and Stresses

Indiana bats in Pennsylvania are threatened by:

- Indiana bats are threatened by direct disturbance in their hibernacula, loss of summer breeding habitat, and development of wind turbines.
- An emerging threat is White nose syndrome (WNS), an illness that emerged in 2006 and has killed over a million bats. "White nose" refers to a ring of white fungus often seen on the faces and wings of affected bats. First observed in a cave in New York in February 2006, white-nose syndrome has spread from New York caves to caves across much of the eastern United States. The U. S. Fish and Wildlife Service has called for a moratorium on caving activities in the affected areas, and strongly recommends that any clothing or equipment used in such areas be decontaminated after each use.

Conservation Recommendations

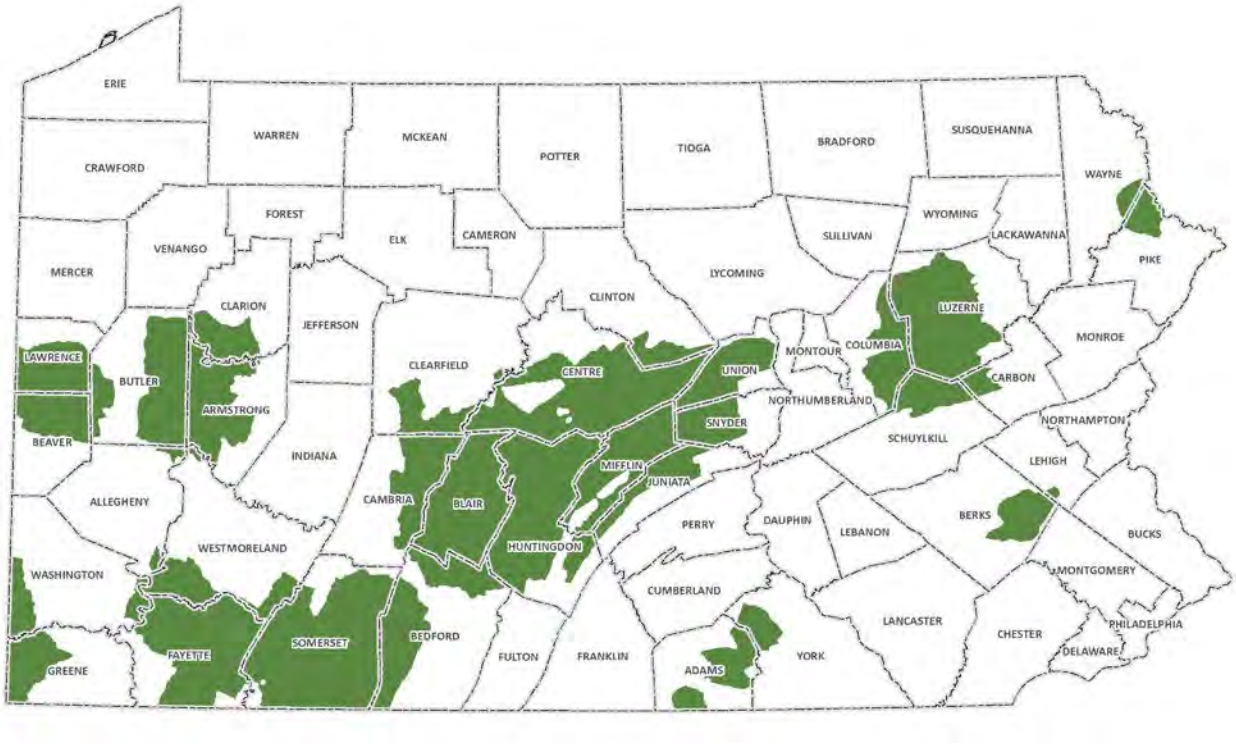
Prompted by declining populations caused by disturbance of bats during hibernation and modification of hibernacula, the Indiana bat was listed in 1967 as "in danger of extinction" under the Endangered Species Preservation Act of 1966. It is listed as "endangered" under the current Endangered Species Act of 1973. Listing under the Endangered Species Act protects the Indiana bat from harming, harassing, and killing and requires Federal agencies to work to conserve it.

The following steps are recommended to ensure the persistence of this species:

- A recovery plan has been developed under the ESA for the Indiana bat in 1983 and the USFWS is now revising that plan. The recovery plan describes actions needed to help the bat recover to viable population sizes.
- Forested land should be managed for Indiana bats by ensuring that there are the size and species of trees needed by Indiana bats for roosting; and providing a supply of dead and dying trees that can be used as roost sites. In addition, caves used for hibernation are managed to maintain suitable conditions for hibernation and eliminate disturbance.
- Understanding the important role played by Indiana bats is a key to conserving the species, therefore helping people learn more about the Indiana bat and other endangered species can lead to more effective recovery efforts.

Additional inquires about the Indiana bat, its habitat, and conservation needs should be directed towards the U.S. Fish and Wildlife Service:

U.S. Fish and Wildlife Service
Pennsylvania Field Office
315 South Allen Street, Suite 322
State College, PA 16801-4850
Phone: 814/234 4090



Regions of Pennsylvania (shaded) that are known to harbor Indiana bat populations.

CONCLUSIONS AND RECOMMENDATIONS

Future Natural Resource Research in the Region

This Natural Heritage Inventory was developed using the most currently available data from the PNHP databases. The data in this report represents a snapshot of the region's natural resources at the time the report was written. Many potential high quality natural habitats in the region have never been surveyed for species of concern, or may have been visited in a season not conducive to the documentation of the species present. Any further work in the area could yield additional records of species of concern while future land use changes may result in the extirpation of species documented in this report. This is partially due to the fact that natural systems are dynamic and constantly changing due to natural and human induced pressures. Additional survey efforts are encouraged for these reasons. The PNHP considers this report a working document that can and should be updated as new information is available.

A Final Note on Rare, Threatened, and Endangered Species

The rare, threatened, and endangered species highlighted in this report are some of the several hundred species in Pennsylvania that are threatened with extirpation or extinction. If a species becomes extinct or is lost from a portion of its native range, the ecosystem in which it lived will lose an important element. Often the repercussions of extinctions are not known until the species is gone, and the species is generally irreplaceable in the system. This may be because the habitat has been altered to the point that the biological system no longer functions properly. Species of concern are often indicative of fragile ecosystems that easily degrade; their protection may help monitor the quality of the region's ecosystems. A great example of a species of concern acting as an indicator of environmental quality is the bald eagle - a species which indicated the deleterious effects of the pesticide DDT in our environment. Banning DDT led to the eventual recovery of the species.

Another reason for protecting species of concern is for their value as unique genetic resources. Every species may provide significant information for future use in genetic research and medical practices. Beyond these practical considerations, perhaps the most compelling reasons for stewardship are the aesthetic and ethical considerations; there is beauty and recreational value inherent in healthy, species-rich ecosystems.

The protection of rare, threatened, and endangered species depends on several factors, including increasing scientific knowledge and concerted efforts from government agencies, conservation organizations, educational institutions, private organizations, and individuals. The following section outlines general recommendations to begin to protect the species outlined in this report.

Using the Natural Heritage Inventory in the Planning Process

One of the main roles of this document is to integrate ecological and conservation information into the planning process. Considering this information early in the planning process allows costly conflicts with rare, threatened and endangered species to be avoided, and protects these resources for future generations. Comprehensive land use planning and its related ordinances can be effective tools for the conservation of the region's biological diversity.

Land use planning establishes guidelines for the kinds of land uses that are suitable in an area and provides a basis for guiding public and private development to benefit communities, the local economy, and the environment. Zoning and subdivision ordinances then set out rules that implement the land use plan. Planning, zoning, and subdivision ordinances are not only valuable tools for urban and suburban areas where development pressures have already affected the use of open space and the integrity of the natural environment, but are also valuable for rural areas where current losses are less pronounced. These areas

can apply planning to avoid the haphazard losses of valuable regional resources, while still achieving desirable levels of development.

Planning for the land use decisions of today and those of the future is an important task and this Natural Heritage Inventory can serve as a useful tool. Pennsylvania Natural Heritage Program staff and expertise are available for additional technical assistance and planning for the conservation of these sites.

General Recommendations

The following are general recommendations for the protection of the Natural Heritage Areas within the region. Approaches to protecting a Natural Heritage Area are wide ranging, and factors such as land ownership, time constraints, and tools and resource availability should be considered when prioritizing protection of these sites. Prioritization works best when incorporated into a long-term region-wide plan. Opportunities may arise that do not conform to a plan, and the decision on how to manage or protect a natural heritage area may be made on a site by site basis. The following are approaches and recommendations for natural heritage area conservation.

1. Consider conservation initiatives for natural heritage areas on private land – *Conservation easements* protect land while leaving it in private ownership. An easement is a legal agreement between a landowner and a conservation or government agency that permanently limits a property's use in order to protect its conservation values. It can be tailored to the needs of both the landowner and the conservation organization, and it will not be extinguished with new ownership. Tax incentives may apply to conservation easements donated for conservation purposes.

   Lease and management agreements also allow the landowner to retain ownership and temporarily ensure protection of land. There are no tax incentives for these conservation methods. A lease to a land trust or government agency can protect land temporarily and ensure that its conservation values will be maintained. This can be a first step to help a landowner decide if they want to pursue more permanent protection methods. Management agreements require landowners and land trusts to work together to develop a plan for managing resources (such as plant or animal habitat, watersheds, forested areas, or agricultural lands) with the land trust offering technical expertise.

   Land acquisition by a conservation organization can be at fair market value or as a bargain sale where a purchase price is set below fair market value with tax benefits that reduce or eliminate the disparity. One strategy is to identify areas that may be excellent locations for new county or township parks. Sites that can serve more than one purpose such as wildlife habitat, flood and sediment control, water supply, recreation, and environmental education are ideal. Private lands adjacent to public lands should be examined for acquisition when a natural heritage area is present on either property, and there is a need of additional land to complete protection of the associated natural features.

   Unrestricted donations of land are welcomed by land trusts. The donation of land entitles the donor to a charitable deduction for the full market value, and it releases the donor from the responsibility of managing the land. If the land is donated because of its conservation value, the land will be permanently protected. A donation of land that is not of high biological significance may be sold, with or without restrictions, to a conservation buyer, and the funds used to further the land trust's conservation mission.

   Local zoning ordinances are one of the best-known regulatory tools available to municipalities. Examples of zoning ordinances a municipality can adopt include: overlay districts where the boundary is tied to a specific resource or interest such as riverfront protection and floodplains, and zoning to protect stream corridors and other drainage areas using buffer zones. Often it is

overlooked that zoning can prevent municipal or county-wide development activities which are undesirable to the majority of the residents, and allow for planning that can meet the goals of the county residents.

2. Prepare management plans that address species of concern and natural communities – Many of the natural heritage areas that are already protected are in need of additional management plans to ensure the continued existence of the associated natural elements. Site-specific recommendations should be added to existing management plans or new plans should be prepared. Recommendations may include: removal of invasive plant species; leaving the area alone to mature and recover from previous disturbance; creating natural areas within existing parks; limiting land-use practices such as mineral extraction, residential or industrial development, and agriculture; or implementing sustainable forestry practices. For example, some species simply require continued availability of a natural community while others may need specific management practices such as canopy thinning, mowing, or burning to maintain their habitat requirements. Existing parks and conservation lands provide important habitat for plants and animals at both the county level and on a regional scale. For example, these lands may serve as nesting or wintering areas for birds or as stopover areas during migration. Management plans for these areas should emphasize a reduction in activities that fragment habitat. Adjoining landowners should be educated about the importance of their land as it relates to habitat value, especially for species of concern, and agreements should be worked out to minimize activities that may threaten native flora and fauna.

3. Protect bodies of water – Protection of reservoirs, wetlands, rivers, and creeks is vital for ensuring the health of human communities and natural ecosystems. Waterways that include natural heritage areas, identified in the Results section of this report, are important, sensitive areas that should be protected. Multiple qualities can be preserved by protecting aquatic habitats. For example, conserving natural areas around watersheds that supply municipal water provides an additional protective buffer around the water supply, maintains habitat for wildlife, and may also provide (low impact) recreation opportunities. Many rare species, unique natural communities, and significant habitats occur in wetlands and water bodies, which are directly dependent on natural hydrological patterns and water quality for their continued existence. Ecosystem processes also provide clean water supplies for human communities and do so at significant cost savings in comparison to water treatment facilities. Therefore, protection of high quality watersheds is the primary way to ensure the viability of natural habitats and water quality. Scrutinize development proposals for their impact on entire watersheds, not just the immediate project area. Cooperative efforts in land use planning among municipal, county, state, and federal agencies, developers, and residents can lessen the impact of development on watersheds.

4. Provide for natural buffers in and around natural heritage areas – Development plans should provide for natural buffers between disturbances and critical zones of natural heritage areas. Proposed activities within the Core Habitat of a Natural Heritage Area should be closely scrutinized for potential immediate impacts to the habitat of elements of concern. Proposed activities within the Supporting Landscape of a Natural Heritage Area should be evaluated for potential long-term impacts to habitats of elements of concern, such as water quality, or quantity degradation, or habitat fragmentation. Disturbances may include construction of new roads and utility corridors, non-sustainable timber harvesting, and fragmentation of large pieces of land. Storm runoff from these activities results in the transport of nutrients and sediments into aquatic ecosystems (Trombulak and Frissell, 2000). Vegetated buffers (preferably of Pennsylvania native plant species) help reduce erosion and sedimentation while shading and cooling the water. Preserving water quality in rivers and streams is important to fish as some species, such as brook trout and some darters, are highly sensitive to poor water quality. Sensitive fish are readily lost from streams when water quality starts to decline. Creating or maintaining a vegetated buffer benefits aquatic animal life, provides habitat for other wildlife species, and creates a diversity of habitats along the creek or stream.

5. Reduce fragmentation of the landscape surrounding natural heritage areas – Encourage development in sites that have already seen past disturbances (especially mined and heavily timbered areas). Care should be taken to ensure that protected natural areas do not become islands surrounded by development. In these situations, the site is effectively isolated, and its value for wildlife is greatly reduced. Careful planning can maintain natural environments along with the plants and animals associated with them. A balance between growth and the conservation of natural and scenic resources can be achieved by guiding development away from the most environmentally sensitive areas. The reclamation of previously disturbed areas for commercial and industrial projects, also known as brownfield development, presents one way to encourage economic growth while allowing ecologically sensitive areas to remain undisturbed. For example, reclaimed surface mines can be used for development (potentially even wind development) when feasible. Cluster development can be used to allow the same amount of development on much less land, and leave the remaining land intact for wildlife and native plants. By compressing development into already disturbed areas with existing infrastructure (villages, roads, existing rights-of-way), large pieces of the landscape can be maintained intact. If possible, networks or corridors of woodlands or greenspace should be preserved linking natural areas to each other. Preserving greenspace around development can provide ample recreation opportunities and potentially increase nearby property value.

6. Manage for invasive species – Invasive species threaten native diversity by dominating habitat used by native species and by disrupting the integrity of the ecosystems they occupy. Management for invasive species depends upon the extent of their establishment. Small infestations may be easily controlled or eliminated, but larger, well established populations typically present difficult management challenges. The earlier exotic invasive species are identified and controlled, the greater the likelihood of eradication with the smallest expenditure of resources.

7. Encourage conservation work by grassroots organizations – County and municipal governments can do much of the work necessary to plan for the protection and management of natural areas identified in this report; however, grassroots organizations are needed to assist with obtaining funding, identifying landowners who wish to protect their land, and providing information about easements, land acquisition, management, and stewardship of protected sites. Increasingly, local watershed organizations and land trusts are taking proactive steps to accomplish conservation at the local level. When activities threaten to impact ecological features, the responsible agency should be contacted. If no agency exists, private groups such as conservancies, land trusts, and watershed associations should be sought for ecological consultation and specific protection recommendations.

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Ambridge Reservoir Valleys NHA

PNHP Significance Rank: *Regional*

Site Description

The slopes on the south side of the Ambridge reservoir contain maturing forest with dense displays of spring wildflowers. The rich soils here are influenced by the Ames Limestone, which surfaces here. The reservoir was created in the early 1950s as a water source for several municipalities to the east.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
West Virginia White (*Pieris virginiensis*)		G3?	S2S3	N (N)	5/9/2013	BC
Sensitive species of concern A[3]	S	---	---	---	5/9/2013	AB

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

A small northeast-facing valley above the reservoir supports of population of the **West Virginia white** butterfly. This population may be unusual because it apparently depends on cut-leaved toothwort (*Cardamine concatenata*) as the host plant for its caterpillars. The most common host plant for this species in Pennsylvania is two-leaved toothwort (*Cardamine diphylla*), and there is evidence (Cappuchino and Kareiva, 1985) that cut-leaved toothwort is not a reliable host plant because it dies back earlier than other toothworts, preventing caterpillars from reaching maturity.

Seep scattered across the lower slopes of the site support a **sensitive species of concern** that is not named at request of the agency overseeing its protection.

David Yeany, PNHP

West Virginia white nectaring on yellow trout-lily (*Erythronium americanum*)

Threats and Stresses

West Virginia whites are vulnerable to a variety of threats. The sensitive species of concern depends on clean groundwater, and is vulnerable to changes in the quality or quantity of the groundwater.

Specific threats and stresses to the elements present at this site include the following:

- Fragmentation of the forest is a serious threat to the West Virginia white, because these butterflies do not cross wide roads or other non-forested areas. The result is that populations

are becoming genetically isolated, and if a population is extirpated the chances are low that remaining populations will be able to recolonize the habitat.

- An even greater threat to the West Virginia white is the spread of garlic mustard (*Alliaria petiolata*). This invasive plant is in the same family as toothworts (the mustard family), and the chemical signatures of the plants are similar enough that female butterflies will readily lay their eggs on garlic mustard. The caterpillars, however, cannot survive on garlic mustard, and these butterflies have disappeared from areas where garlic mustard is dominant. At this site garlic mustard is present at low densities, but widely distributed across the site.
- High densities of white-tailed deer pose another threat to West Virginia whites, because deer browsing greatly reduces the abundance of many of the wildflowers that are crucial nectar sources for the butterflies. Although their flight period is short, adults rely on several successive waves of spring wildflowers to produce a steady supply of nectar. A reduction in abundance or diversity of spring wildflowers can leave these butterflies without a source of food.
- The greatest threat to groundwater-dependent species like the sensitive species of concern is disruption to bedrock or any activity that alters groundwater flows or the quality of groundwater. High densities of water wells can depress water tables, causing springs and seeps to become dry or shrink in size. Groundwater pollution can occur from septic systems, improperly lined underground waste disposal, and, in agricultural areas, from infiltration of pesticides, fertilizers, or nutrients from animal wastes.
- Other invasive plant species are also a threat to biodiversity at this site. Japanese barberry (*Berberis thunbergii*) and bush honeysuckle (*Lonicera* sp.) are present. A patch of lily-of-the-valley (*Convallaria majalis*) is near the remains of an old homestead.

Conservation Recommendations

Most of the Core Habitat of this site is protected for water quality purposes by the Ambridge Water Authority, although the Core Habitat extends onto adjacent private lands. There is no public access to the Ambridge Water Authority lands.

The following steps are recommended to ensure the persistence of these species at this site:

- Garlic mustard and other invasive species must be controlled in this area to avoid serious losses of biodiversity. Fragmentation of the remaining forest should be avoided. New development such as housing, roads, and powerlines should be concentrated in areas that have already been disturbed. White-tailed deer should be kept to a low density to avoid degradation of the forest's diversity.
- Drilling, mining, or other disruptions to bedrock should not be undertaken within one-half mile of a seepage wetland without a thorough understanding of local bedrock geology, surficial geology, and groundwater flows. Groundwater flow patterns do not always mirror surface watersheds, and in some cases aquifers may be contiguous over large areas.
- Septic systems and water wells should be avoided or kept to low densities near the Core Habitat.
- Additional surveys for West Virginia white are warranted in other valleys around the reservoir. Additional research to conclusively determine which host plants are used by West Virginia whites at this site would help settle the question of whether cut-leaved toothwort can be the sole host plant for a population of these butterflies.

Location

Municipalities: *Beaver County: Hanover Township, Independence Township, Raccoon Township*
USGS quads: *Hookstown, Aliquippa*

Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Ambridge Reservoir*

References and Additional Reading

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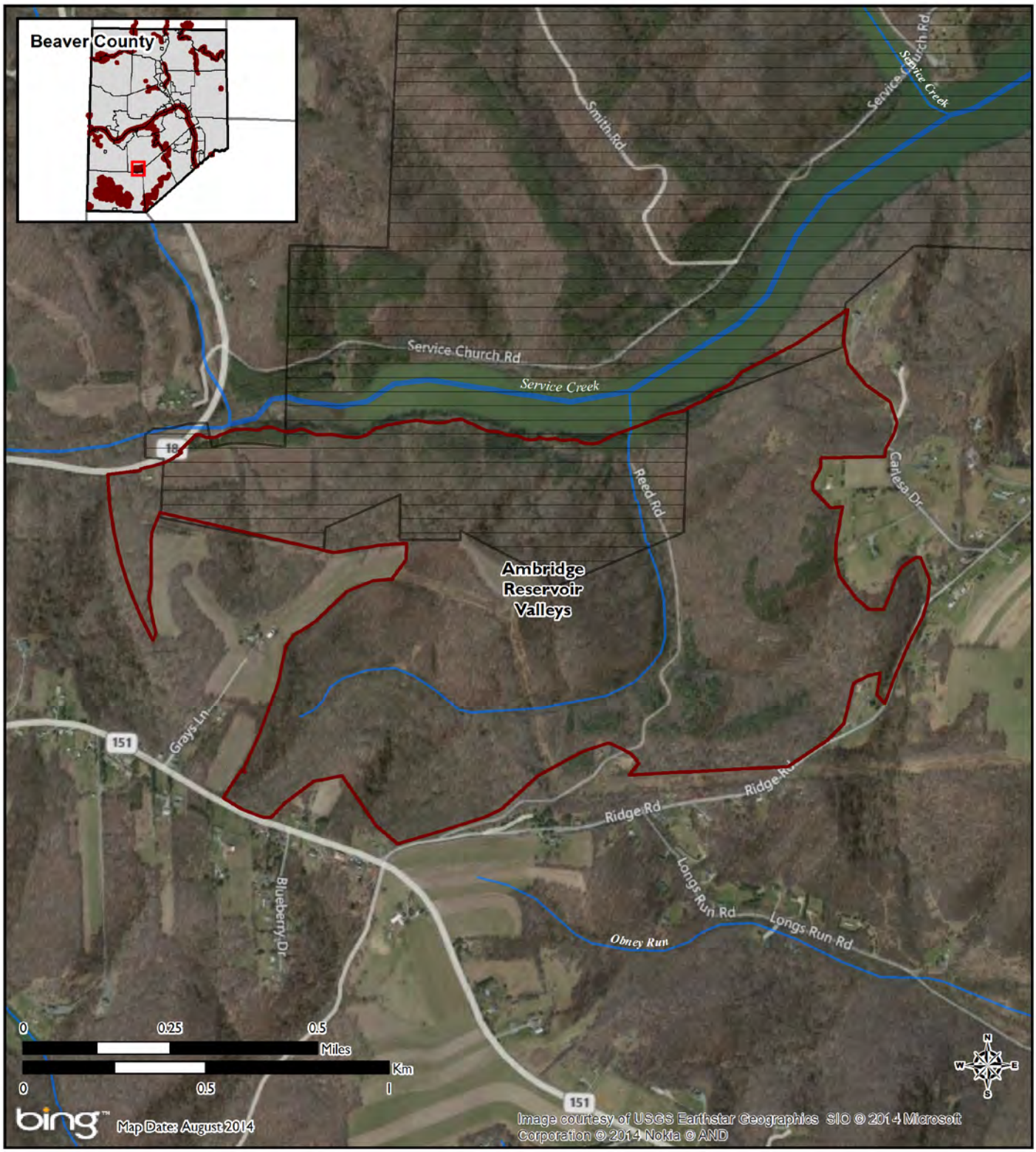


Ambridge Reservoir Valleys Natural Heritage Area

Forests at this site provide habitat for the globally vulnerable West Virginia white butterfly and a sensitive species of concern.

Significance Rank:
REGIONAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Supporting Landscape***
- ***Conservation Lands***

Beaver Creek NHA

PNHP Significance Rank: *State*

Site Description

The small portion of Beaver Creek that is within Pennsylvania, along with the adjacent uplands, support the **blue-tipped dancer** and the **dusky dancer** (two damselfly species of concern) and **one sensitive species of concern**. This site is part of an extensive, only lightly fragmented, forested riparian corridor that runs from the mouth of the Beaver River to many miles upstream in Ohio.

Pete Woods, PNHP

Beaver Creek

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Blue-tipped Dancer (*Argia tibialis*)		G5	S2	N (N)	6/25/2013	AC
Dusky Dancer (*Argia translata*)		G5	S3S4	N (N)	7/30/2013	AC
Sycamore - (river birch) - box-elder floodplain forest	C	GNR	S4	N (N)	9/16/1992	E
Sensitive species of concern A[3]	S	---	---	---	6/25/2013	E

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Threats and Stresses

Maintaining suitable aquatic habitat is key to the continued success of the aquatic species of concern. Runoff from dirt and gravel roads in close proximity to waterways can contribute to physical degradation of their channels and erosion and sediment pollution in streams and rivers. Loss of forest cover within the core areas may also result in increased water temperatures and disruption of natural nutrient cycling linked to the river. If forest cover is substantially reduced within the watersheds, water quality is likely to decline from increased sediment loads. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events.

Specific threats and stresses to the elements present at this site include the following:

- Damselflies rely on good water quality, although the tolerances of individual species to different types of pollution are not well-understood. Erosion, whether caused by deforestation, poor agricultural practices, or the destruction of riparian zones, leads to increased silt loads and shifting, unstable stream bottoms. Siltation and contaminants such as heavy metals, pesticides, and abandoned mine drainage are potential threats to these species. The sensitive species of concern is also vulnerable to water quality degradation.

Conservation Recommendations

The Pennsylvania portion of the site is privately owned, without any permanent form of protection. There is no public access to this area. The adjacent land on the Ohio side of the border is protected from development as part of Beaver Creek State Forest.

The following steps are recommended to ensure the persistence of these species at this site:

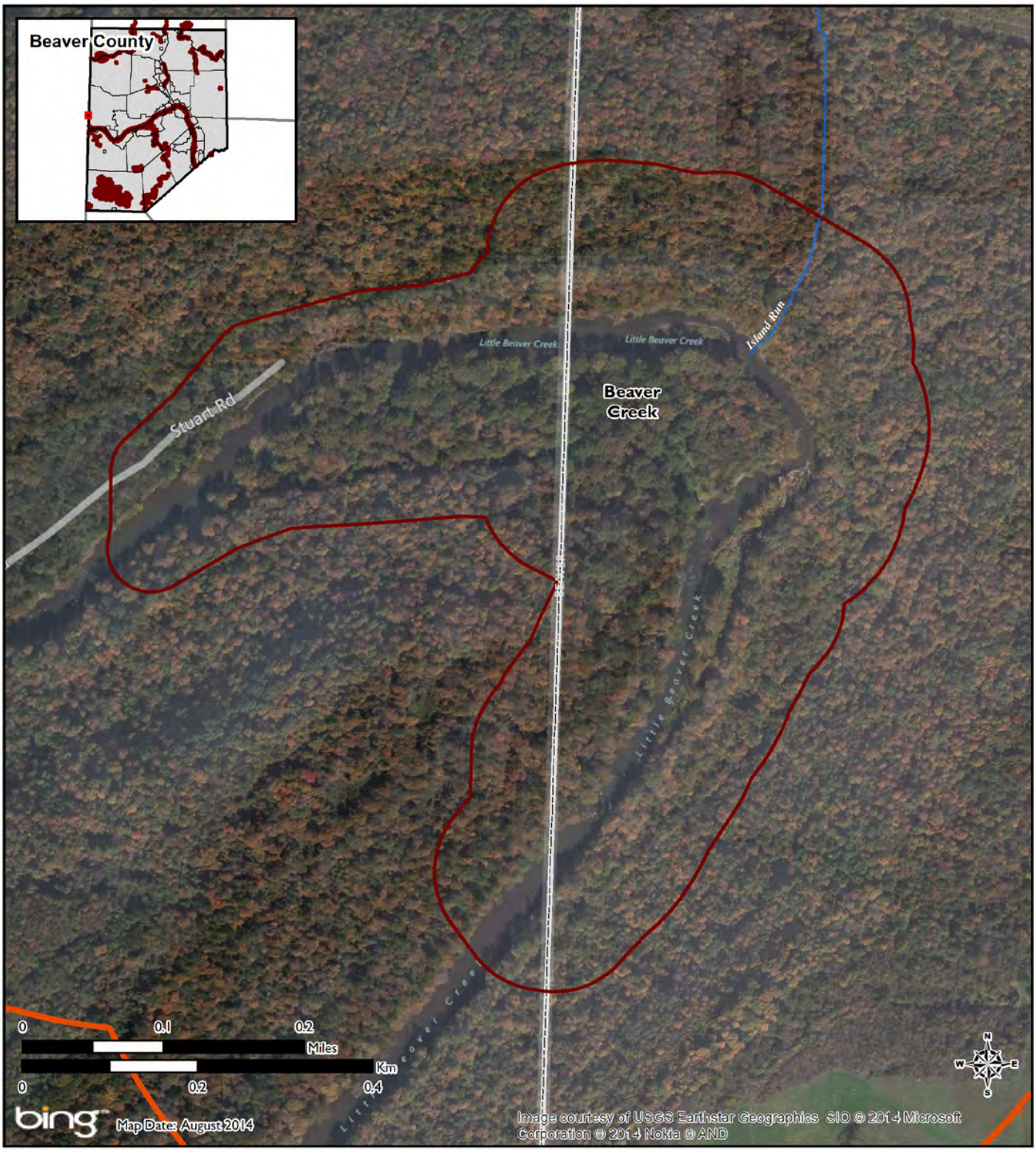
- Conserve the forested riparian buffers of all streams and wetlands. Conserve at least a 100 meter (328 feet) buffer of native woody vegetation where it exists along the waterways and establish at least a 30 meter (100 foot) buffer where it is lacking to help reduce erosion, sedimentation, and pollution. Additionally, best management practices (BMPs) that focus on limiting the introduction of non-point sources of pollution into surface and groundwater should be applied to the surrounding area.

Pete Woods, PNHP

Dusky Dancer (*Argia translata*)

Location

Municipalities: *Beaver County: Ohioville Borough*
USGS quads: *East Liverpool North, Midland*
Previous CNHI reference: *Little Beaver Creek Floodplain*
Associated NHAs: *None*
Overlapping Protected Lands: *Little Beaver Creek Floodplain*



Beaver Creek
Natural Heritage Area

Highly diverse habitat supports a Sycamore - (River Birch) - Box-elder Floodplain Forest natural community and habitat for three animal species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas
- ***Core Habitat***
- **Supporting Landscape**
- ***Other Supporting Landscape***

Beaver River at Canal Dam NHA

PNHP Significance Rank: *State*

Site Description

This stretch of the Beaver River supports the **dusky dancer**, a damselfly species of concern. Although the dusky dancer is not a riffle specialist, the rapids below the dam potentially offers habitat to numerous riffle-breeding dragonflies of concern. Similar habitat is present upriver at Eastvale Dam and downstream at Fallston Dam, and many of the same dragonflies and damselflies might be found there.

Canal Dam and the associated lock were constructed in the 1830s to allow the passage of boats along the Beaver and Erie Canal.

Pete Woods, PNHP

The rapids at Canal Dam

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name	PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Dusky Dancer (*Argia translata*)	G5	S3S4	N (N)	8/23/2013	AC

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

Threats and Stresses

The flow of the Beaver River has been altered from its original state by dams, and a legacy of pollution in the early 1900s removed much of the river's fauna (USACE 1999 and 2001). The urbanization of the adjacent upland areas presents a challenge to water quality, although the water quality may be largely determined by development patterns higher in the watershed.

Maintaining suitable aquatic habitat is key to the continued success of the species of concern. Runoff from dirt and gravel roads in close proximity to waterways can contribute to physical degradation of their channels and erosion and sediment pollution in streams and rivers. Loss of forest cover within the core areas may also result in increased water temperatures and disruption of natural nutrient cycling linked to the river. If forest cover is substantially reduced within the watersheds, water quality is likely to decline from increased sediment loads. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events.

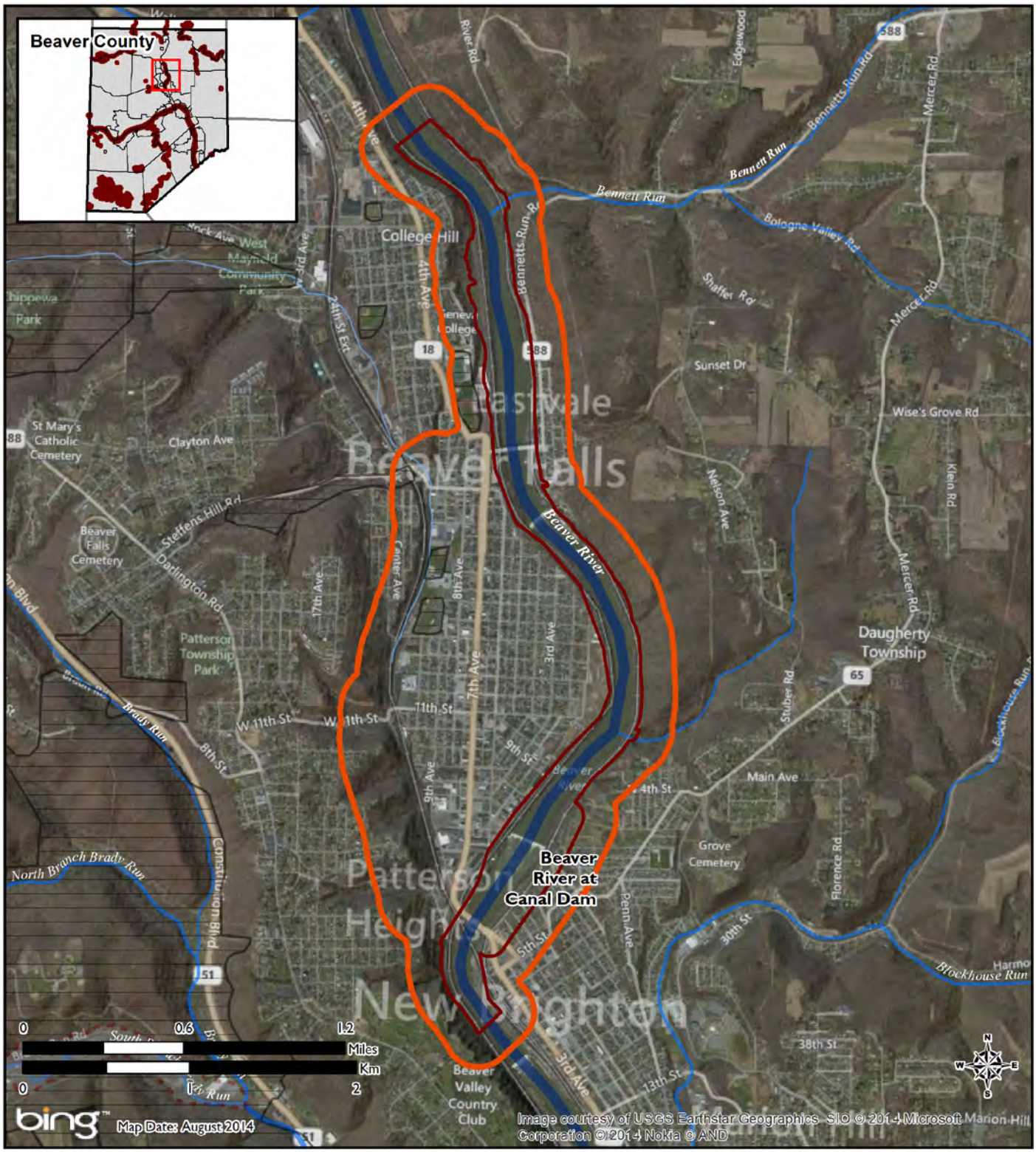
- Damselflies rely on good water quality, although the tolerances of individual species to different types of pollution are not well-understood. Erosion, whether caused by deforestation, poor agricultural practices, or the destruction of riparian zones, leads to increased silt loads and shifting, unstable stream bottoms. Siltation and contaminants such as heavy metals, pesticides, and abandoned mine drainage are potential threats to these species.

Conservation Recommendations

- Conserve and expand the forested riparian buffers of the Beaver River and its tributaries. Streams through forested areas should be considered high priority for conservation. The forested riparian corridor helps to regulate the temperature of the stream and creates streamside conditions that contribute to improved water quality and aquatic habitat. Streams through non-forested areas should be restored with native trees and shrubs appropriate to the habitat. Establish at least a 100 foot buffer of woody vegetation along the creek and its tributaries to help reduce erosion, sedimentation, and pollution. Additionally, best management practices (BMPs) that focus on limiting the introduction of non-point sources of pollution into surface and groundwater should be applied to the surrounding area.
- Additional dragonfly surveys are warranted at this site.

Location

Municipalities: *Beaver County: Beaver Falls City, Daugherty Township, Eastvale Borough, New Brighton Borough, North Sewickley Township, Patterson Heights Borough, Patterson Township*
USGS quads: *Beaver Falls*
Previous CNHI reference: *New Brighton Valley*
Associated NHAs: *None*
Overlapping Protected Lands: *New Brighton Valley*



Beaver River at Canal Dam Natural Heritage Area

Aquatic habitat on the Beaver River supports a population of the dusky dancer, a damselfly species of concern in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Core Habitat***
- ***Other Supporting Landscape***
- ***Conservation Lands***

Beaver River at Rock Point NHA

PNHP Significance Rank: *Regional*

Site Description

At the confluence of the Connoquenessing Creek and the Beaver River, there is a riffle on the Beaver River that provides breeding habitat for a variety of dragonfly and damselfly species of concern. One of these, the **elusive clubtail**, is globally rare, and had not been seen in Pennsylvania since 1921 until it was rediscovered at this site in 2013. Other rarities include the **russet-tipped clubtail**, not previously documented in this region, and the **royal river cruiser**, only recently found in Pennsylvania, and the globally rare **rapids clubtail**.

The first Elusive Clubtail found in Pennsylvania since 1921.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Blue-tipped Dancer (*Argia tibialis*)		G5	S2	N (N)	6/11/2013	AC
Dusky Dancer (*Argia translata*)		G5	S3S4	N (N)	8/23/2013	E
Midland Clubtail (*Gomphus fraternus*)		G5	S2S3	N (N)	6/9/2014	E
Rapids Clubtail (*Gomphus quadricolor*)		G3G4	S1S2	N (N)	6/9/2014	E
Cobra Clubtail (*Gomphus vastus*)		G5	S3S4	N (N)	8/27/2013	E
Royal River Cruiser (*Macromia taeniolata*)		G5	S1	N (N)	8/25/2013	E
Elusive Clubtail (*Stylurus notatus*)		G3	SH	N (N)	9/6/2013	E
Russet-tipped Clubtail (*Stylurus plagiatus*)		G5	S1	N (N)	8/20/2013	AC

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

An incident of historical interest occurred just a few yards away from the riffle where the dragonfly species of concern were documented. The teen-aged James Garfield almost drowned when he fell off his wagon into the river in the winter of 1847 while crossing the mouth of Connoquenessing Creek. He grabbed a rope trailing in the water, and survived to become President of the United States.

Threats and Stresses

The Beaver River suffered from severe industrial pollution to several of its tributaries, dating back to the beginning of the 20th century which largely extirpated the native fauna of the river.

Maintaining suitable aquatic habitat is the key to the continued success of the species of concern. Runoff from dirt and gravel roads in close proximity to waterways can contribute to physical degradation of their channels and erosion and sediment pollution in streams and rivers. Loss of forest cover within the core areas may also result in increased water temperatures and disruption of natural nutrient cycling linked to the river. If forest cover is substantially reduced within the watersheds, water quality is likely

to decline from increased sediment loads. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events.

- Dragonflies rely on good water quality, although the tolerances of individual species to different types of pollution are not well-understood. Erosion, whether caused by deforestation, poor agricultural practices, or the destruction of riparian zones, leads to increased silt loads and shifting, unstable stream bottoms. Siltation and contaminants such as heavy metals, pesticides, and abandoned mine drainage are potential threats to these species.

Conservation Recommendations

Water quality has improved dramatically in the Beaver River's tributaries, but a legacy of contaminated sediments remains (USACE, 1999 and 2001) along with continuing non-point source pollution and a depauperate fauna. No freshwater mussels are currently known from the Beaver River, although the lower Connoquenessing Creek has a rebounding population of a number of mussel species that is a potential source for recolonization of this part of the Beaver (Lang, 2002). Compared to the freshwater mussels, dragonflies and damselflies are much more mobile and are able to more easily recolonize previously polluted rivers. Additionally, their shorter lifespans (up to three years as nymphs) may make them better able to cope with polluted sediments than the long-lived mussels. All of the species documented here may be distributed elsewhere in the Beaver River, but additional surveys are needed to demonstrate this.


Ben Coulter

The first record of a Rapids Clubtail for Lawrence County.

- Conserve and expand the forested riparian buffers of the Beaver River and its tributaries. Streams through forested areas should be considered high priority for conservation. The forested riparian corridor helps to regulate the temperature of the stream and creates streamside conditions that contribute to improved water quality and aquatic habitat. Streams through non-forested areas should be restored with native trees and shrubs appropriate to the habitat. Establish at least a 100 foot buffer of woody vegetation along the creek and its tributaries to help reduce erosion, sedimentation, and pollution.
- Additionally, best management practices (BMPs) that focus on limiting the introduction of non-point sources of pollution into surface and groundwater should be applied to the surrounding area.

Location

Municipalities: Beaver County: *Big Beaver Borough, North Sewickley Township; Lawrence County: New Beaver Borough, Wampum Borough, Wayne Township*
USGS quads: *New Castle South, Beaver Falls*
Previous CNHI reference: *Rock Point, Beaver River Confluence Slopes*
Associated NHAs: *None*
Overlapping Protected Lands: *Rock Point, Beaver River Confluence Slopes*

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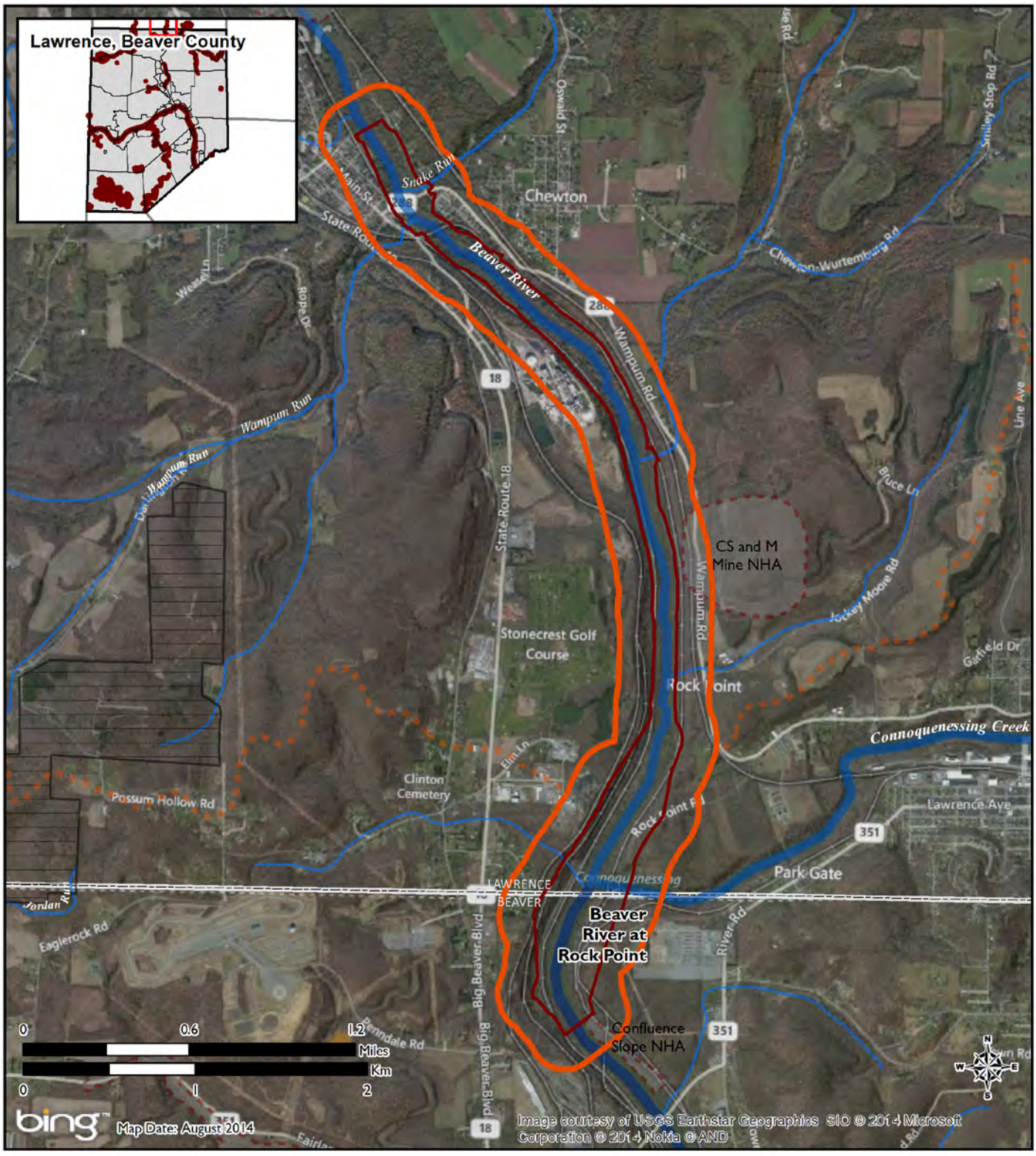
U.S. Army Corps of Engineers. 2001. Lower Mahoning River, Pennsylvania environmental dredging reconnaissance study. U.S. Army Corps of Engineers, Pittsburgh District.



Beaver River at Rock Point Natural Heritage Area

This section of the Beaver River supports a number of dragonfly species of concern, including the once considered extirpated elusive clubtail.

Significance Rank:
REGIONAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Core Habitat***
- ***Other Supporting Landscape***
- ***Conservation Lands***

Beaver-Lawrence County Line Wetlands NHA

PNHP Significance Rank: *State*

Site Description

In contrast to most other floodplain wetlands in Beaver County, this one is fairly intact and has a diverse flora. A silver maple floodplain forest occupies most of the wetland. There are a number of channel scar pools, ranging from slightly vegetated vernal pools to open herbaceous ponds. Another herbaceous wetland is dominated by water dock (*Rumex orbiculatus*), and another marsh is dominated by wide-leaved cattail (*Typha latifolia*). One pond is larger than the others, and may have been deepened by excavation. The slopes above the floodplain have been strip mined.

Pete Woods, PNHP

Male blue-ringed dancer

Short-awn foxtail is a rare grass which grows abundantly at this site. One channel scar pool contains a small population of **stalked bulrush**. The North Fork of Little Beaver Creek supports populations of **blue-ringed dancer**, a damselfly species of concern, as well as **cylindrical papershell**, a mussel species of concern. Open and edge habitats on the floodplain support **silvery checkerspot**.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name	PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Silvery Checkerspot (*Chlosyne nycteis*)	G5	S3S4	N (N)	8/23/2013	AC
Blue-ringed Dancer (*Argia sedula*)	G5	S1S3	N (N)	8/23/2013	AC
Cylindrical Papershell (*Anodontoides ferussacianus*)	G5	S2S3	N (CR)	8/15/1997	E
Short-awn Foxtail (*Alopecurus aequalis*)	G5	S3	N (PT)	7/14/1992	E
Stalked Bulrush (*Scirpus pedicellatus*)	G4	S1	PT (PT)	8/22/2013	C

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

Threats and Stresses

Maintaining suitable aquatic habitat is the key to the continued success of the aquatic species of concern. Runoff from dirt and gravel roads in close proximity to waterways can contribute to physical degradation of their channels and erosion and sediment pollution in streams and rivers. Loss of forest cover within the core areas may also result in increased water temperatures and disruption of natural nutrient cycling linked to the river. If forest cover is substantially reduced within the watersheds, water quality is likely to decline from increased sediment loads. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events.

Specific threats and stresses to the elements present at this site include the following:

- Damselflies rely on good water quality, although the tolerances of individual species to different types of pollution are not well-understood. Erosion, whether caused by deforestation, poor agricultural practices, or the destruction of riparian zones, leads to increased silt loads and

shifting, unstable stream bottoms. Siltation and contaminants such as heavy metals, pesticides, and abandoned mine drainage are potential threats to these species.

Conservation Recommendations

The following steps are recommended to ensure the persistence of these species at this site:

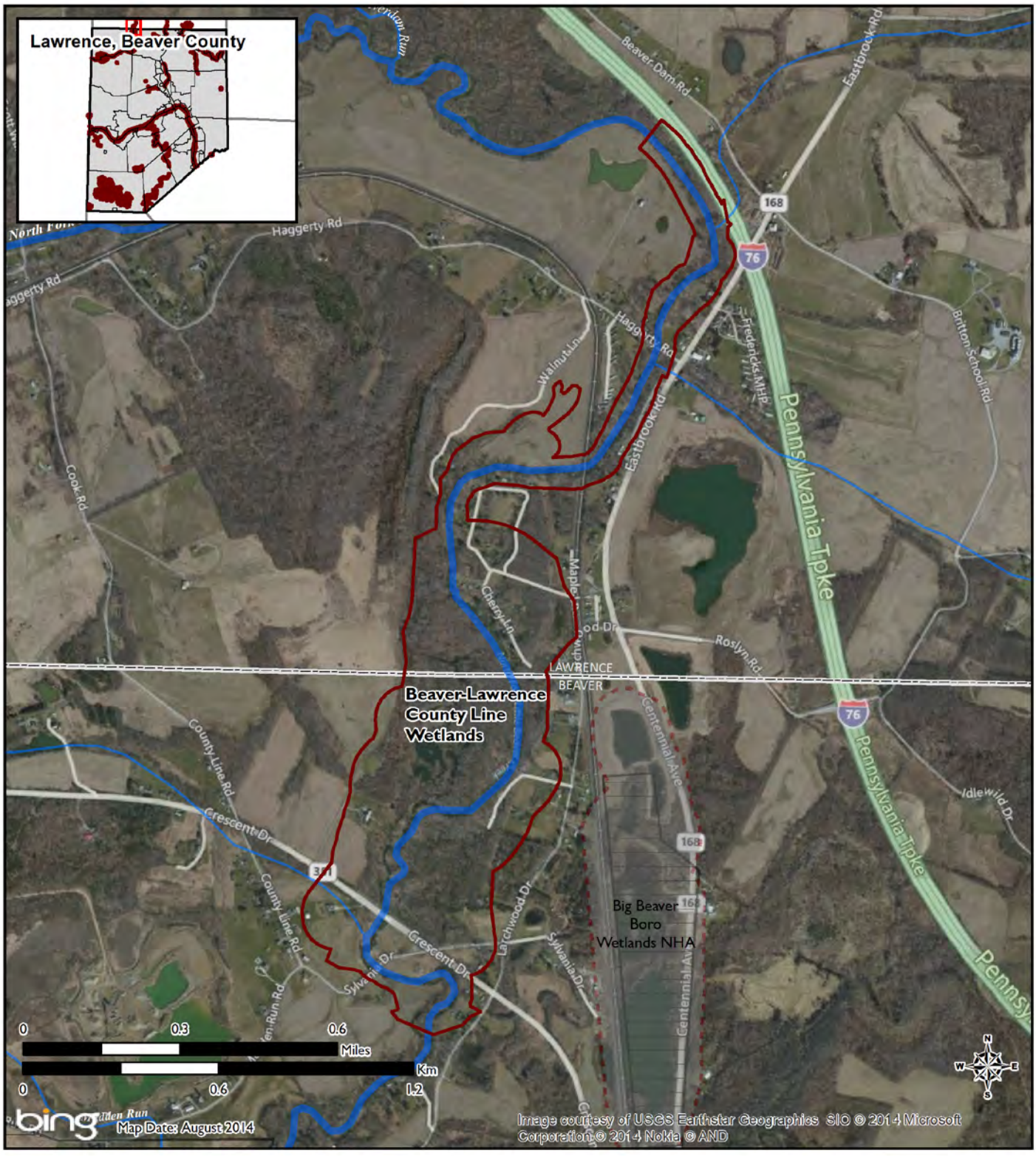
- Conserve the forested riparian buffers of all streams and wetlands. Conserve at least a 100 meter (328 feet) buffer of native woody vegetation where it exists along the waterways and wetlands and establish at least a 30 meter (100 foot) buffer where it is lacking to help reduce erosion, sedimentation, and pollution.
- Additionally, best management practices (BMPs) that focus on limiting the introduction of non-point sources of pollution into surface and groundwater should be applied to the surrounding area.

Pete Woods, PNHP

A floodplain pool with an emergent marsh.

Location

Municipalities: Beaver County: *Big Beaver Borough, Darlington Township; Lawrence County: Little Beaver Township, New Beaver Borough*
USGS quads: *New Galilee*
Previous CNHI reference: *County Line Wetlands*
Associated NHAs: *None*
Overlapping Protected Lands: *County Line Wetlands*



Beaver-Lawrence County Line Wetlands Natural Heritage Area

Wetlands along the North Fork Little Beaver Creek support several animal species of concern as well as two plant species of concern.

Significance Rank:
STATE

Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- *Core Habitat*
- *Supporting Landscape*
- *Other Core Habitat*
- *Other Supporting Landscape*
- *Conservation Lands*

Big Beaver Boro Wetlands NHA

PNHP Significance Rank: *State*

Site Description

This 15 acre wetland was built by the Pennsylvania Turnpike Commission to replace wetlands destroyed by the construction of Turnpike 60. It is now managed by Big Beaver Borough. For a constructed wetland, the plant diversity is impressive. Low gradients allow broad wetland vegetation zones, ranging from open water to uplands. A path around the perimeter allows public access.

Pete Woods, PNHP

The wetland seen from Route 168.

Core Habitat includes the more disturbed gravel ponds to the north and south, which are hydrologically connected to the restored wetland through the gravel substrate and which could potentially support the same species.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name	PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Azure Bluet (*Enallagma aspersum*)	G5	S3S4	N (N)	7/12/2013	AC

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

This wetland is breeding habitat for the **azure bluet**, a damselfly species of concern

Threats and Stresses

Maintaining suitable aquatic habitat is the key to the continued success of the azure bluet. Runoff from dirt and gravel roads in close proximity to wetlands can contribute to their physical degradation. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events.

Specific threats and stresses to the elements present at this site include the following:

- Damselflies rely on good water quality, although the tolerances of individual species to different types of pollution are not well-understood. Erosion, whether caused by deforestation, poor agricultural practices, or the destruction of riparian zones, leads to wetland degradation. Siltation and contaminants such as heavy metals, pesticides, and abandoned mine drainage are potential threats to these species.

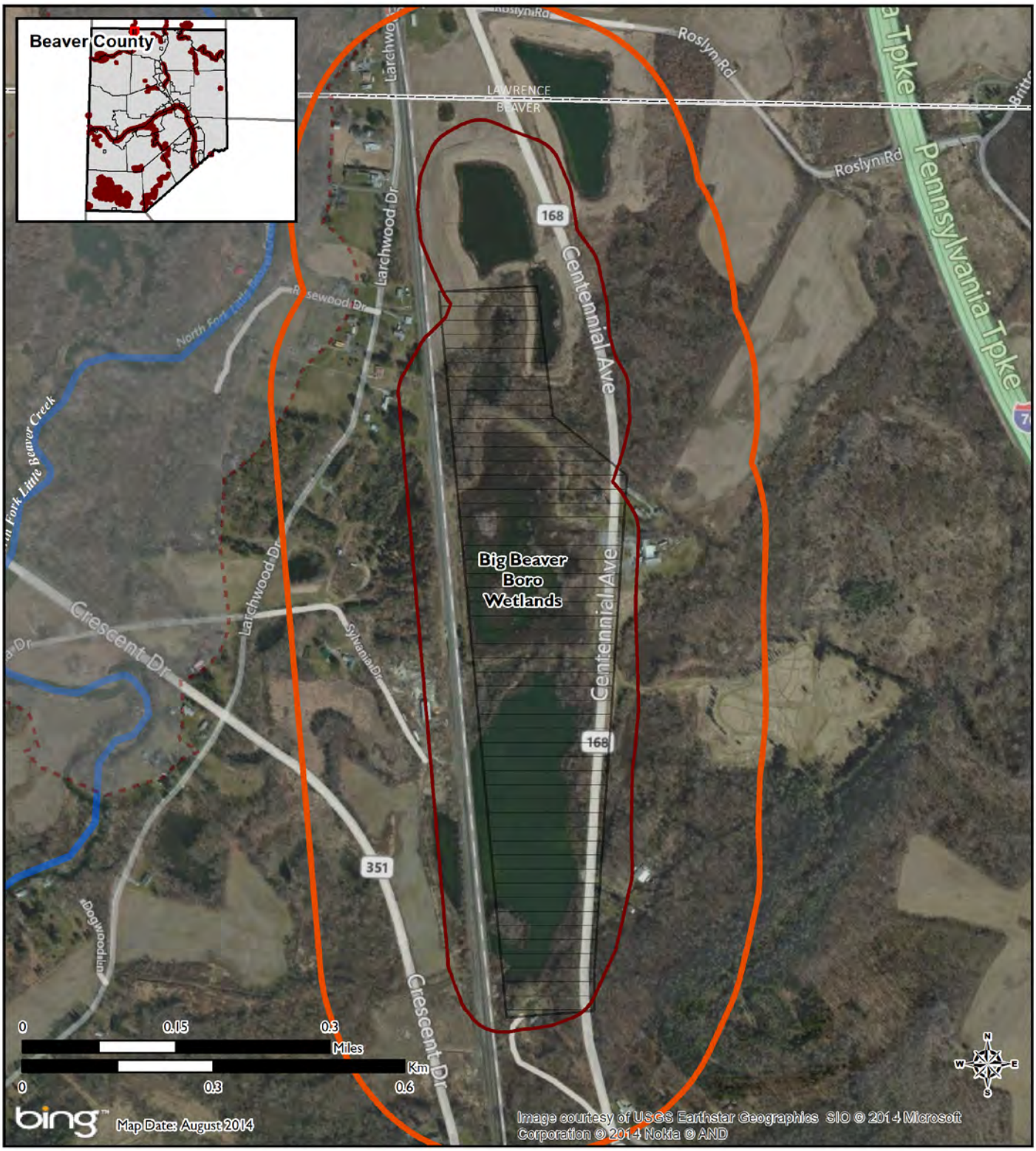
Conservation Recommendations

The following steps are recommended to ensure the persistence of these species at this site:

- Conserve the forested riparian buffers of the wetlands. Conserve at least a 100 meter (328 feet) buffer of native woody vegetation where it exists along the waterways and establish at least a 30 meter (100 foot) buffer where it is lacking to help reduce erosion, sedimentation, and pollution.
- Additionally, best management practices (BMPs) that focus on limiting the introduction of non-point sources of pollution into surface and groundwater should be applied to the surrounding area.

Location

Municipalities: Beaver County: *Big Beaver Borough*
USGS quads: *New Galilee*
Previous CNHI reference: *County Line Wetlands, New Galilee Swamp*
Associated NHAs: *None*
Overlapping Protected Lands: *County Line Wetlands, New Galilee Swamp*



Big Beaver Boro Wetlands Natural Heritage Area

Natural and human-made wetlands provide habitat for azure bluet, a damselfly species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- *Core Habitat*
- *Supporting Landscape*
- *Other Core Habitat*
- *Other Supporting Landscape*
- *Conservation Lands*

Big Sewickley Creek Woods NHA

PNHP Significance Rank: *State*

Site Description

Located on the border between Beaver and Allegheny counties, this site includes a patch of forest in the Big Sewickley Creek valley. This riparian forest and adjacent lands support a **sensitive species of concern**.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Sensitive species of concern A[3]	**S**	---	---	---	3/21/2014	B

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Threats and Stresses

Specific threats and stresses to the elements present at this site include the following:

- The sensitive species of concern is vulnerable to human disturbance. Significant additional human disturbance within 305 meters (1000 feet) could trigger permanent abandonment of the area. The species appears to be habituated to the current levels of traffic and other human activities, but any extreme events or increase in activity or noise could cause abandonment.
- The species of concern at this site rely on good water quality, and are vulnerable to siltation and chemical pollution.

Conservation Recommendations

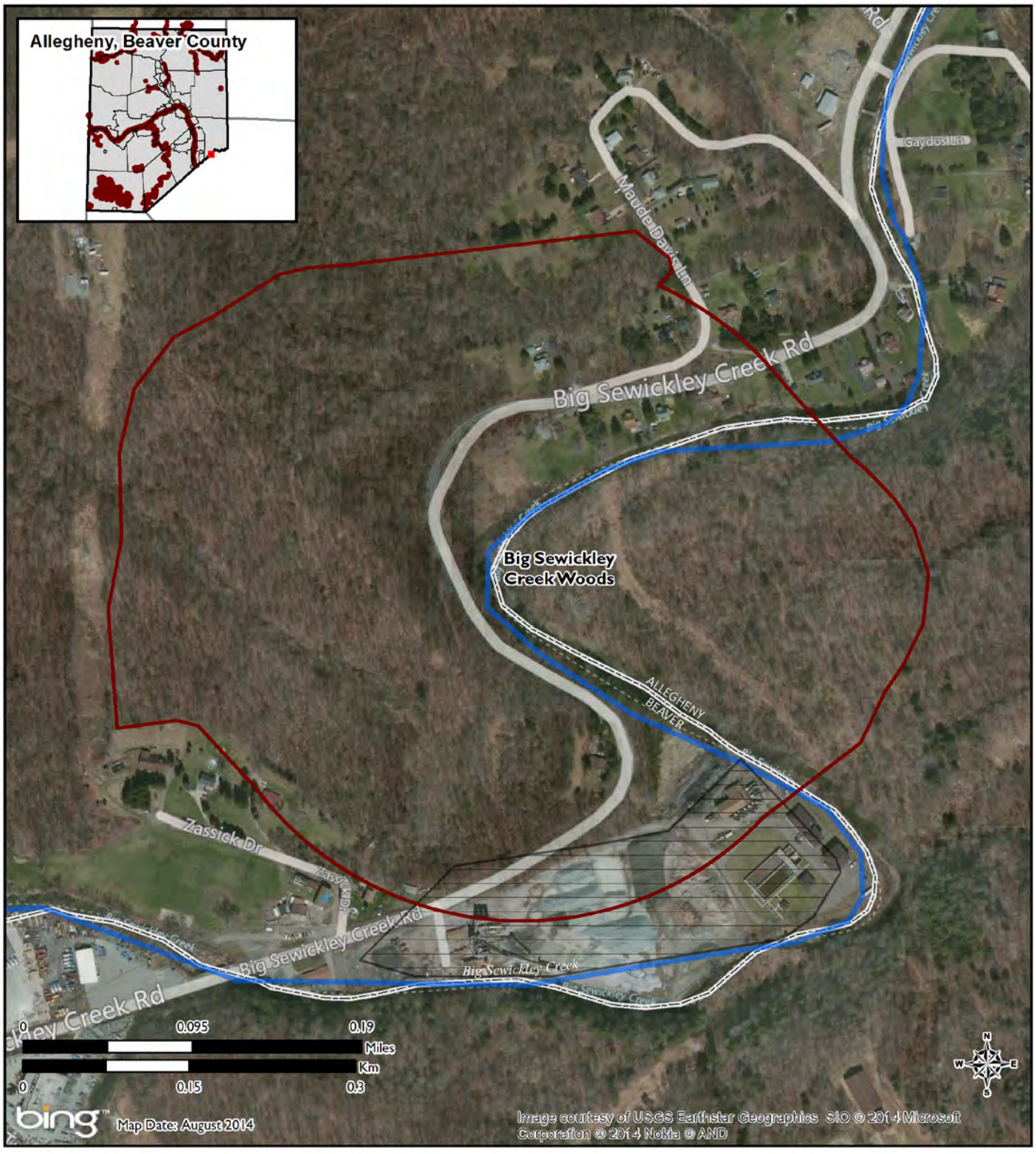
Additional development within the Core Habitat should be avoided to protect the sensitive species of concern. Disturbance within the Core Habitat should not be a problem for this species if it occurs during the non-breeding season (September – February).

The following steps are recommended to ensure the persistence of these species at this site:

- Avoid or minimize human disturbance to the Core Habitat during the March through August breeding season.
- Maintain at least a 30 meter (100 foot) buffer of woody vegetation along streams to help reduce erosion, sedimentation, and pollution. Nearby streams through non-forested areas should be restored with native trees and shrubs appropriate to the habitat.
- Additionally, best management practices (BMPs) that focus on limiting the introduction of non-point sources of pollution into surface and groundwater should be applied to the surrounding area
- Avoid fragmenting the existing forested areas with additional buildings or infrastructure.

Location

Municipalities: *Allegheny County: Bell Acres Borough; Beaver County: Economy Borough*
USGS quads: *Ambridge*
Previous CNHI reference: *Campmeeting Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *Campmeeting Woods*



Big Sewickley Creek Woods Natural Heritage Area

Forest and aquatic habitats at this site support a sensitive species of concern.

Significance Rank:
STATE

Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Supporting Landscape***
- ***Conservation Lands***

Brady Run Slope NHA

PNHP Significance Rank: *State*

Site Description

This site is a young forest dominated by red oak (*Quercus rubra*), sugar maple (*Acer saccharum*), and red maple (*Acer rubrum*). The south-facing slopes here support a population of **wild kidney bean** (*Phaseolus polystachios*). The population was not found during the most recent survey, but it may still be present.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name	PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Wild Kidney Bean (*Phaseolus polystachios*) 	G5	S1S2	N (PE)	2000	E

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.
[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

Threats and Stresses

Wild kidney bean is a generalist upland forest species, and can grow in a variety of conditions. The reasons for its rarity in Pennsylvania are not well understood.

Specific threats and stresses to the elements present at this site include the following:

- Conversion of forest to other land uses would be a threat.
- Invasive plants are a potential threat.

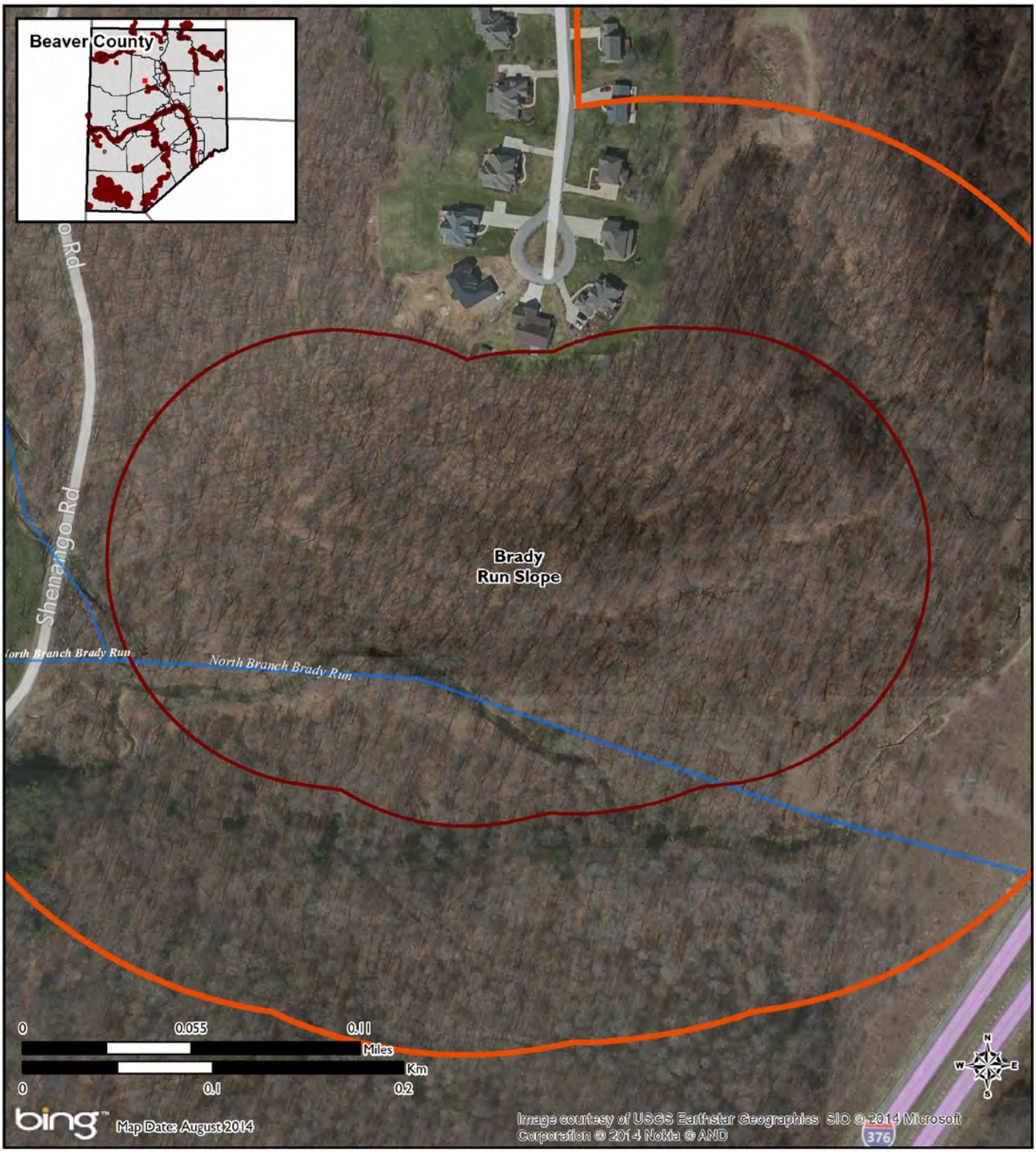
Conservation Recommendations

Maintain the site as a forest.
The following steps are recommended to ensure the persistence of these species at this site:

- Monitor for invasive plant species and control them if present.

Location

Municipalities: Beaver County: *Chippewa Township*
USGS quads: *Beaver*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Brady Run Slope
Natural Heritage Area

Upland forest at Brady Run Slope supports two plant species of concern: featherbells and wild kidney bean.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas
- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Supporting Landscape***

Brush Creek NHA

PNHP Significance Rank: *State*

Site Description

The stretch of Brush Creek, along with the adjacent uplands, supports the **blue-tipped dancer** (a damselfly species of concern) and a **sensitive species of concern**.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Blue-tipped Dancer (*Argia tibialis*)		G5	S2	N (N)	6/20/2013	AC
Sensitive species of concern A[3]	S	---	---	---	6/19/2013	E

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Threats and Stresses

Maintaining suitable aquatic habitat is the key to the continued success of the aquatic species of concern. Runoff from dirt and gravel roads in close proximity to waterways can contribute to physical degradation of their channels and erosion and sediment pollution in streams and rivers. Loss of forest cover within the core areas may also result in increased water temperatures and disruption of natural nutrient cycling linked to the river. If forest cover is substantially reduced within the watersheds, water quality is likely to decline from increased sediment loads. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events.

Pete Woods, PNHP

Brush Creek

Specific threats and stresses to the elements present at this site include the following:

- Damselflies rely on good water quality, although the tolerances of individual species to different types of pollution are not well-understood. Erosion, whether caused by deforestation, poor agricultural practices, or the destruction of riparian zones, leads to increased silt loads and shifting, unstable stream bottoms. Siltation and contaminants such as heavy metals, pesticides, and abandoned mine drainage are potential threats to these species. The sensitive species of concern is also vulnerable to water quality degradation.

Conservation Recommendations

Most of this site is contained within Brush Creek County Park.

The following steps are recommended to ensure the persistence of these species at this site:

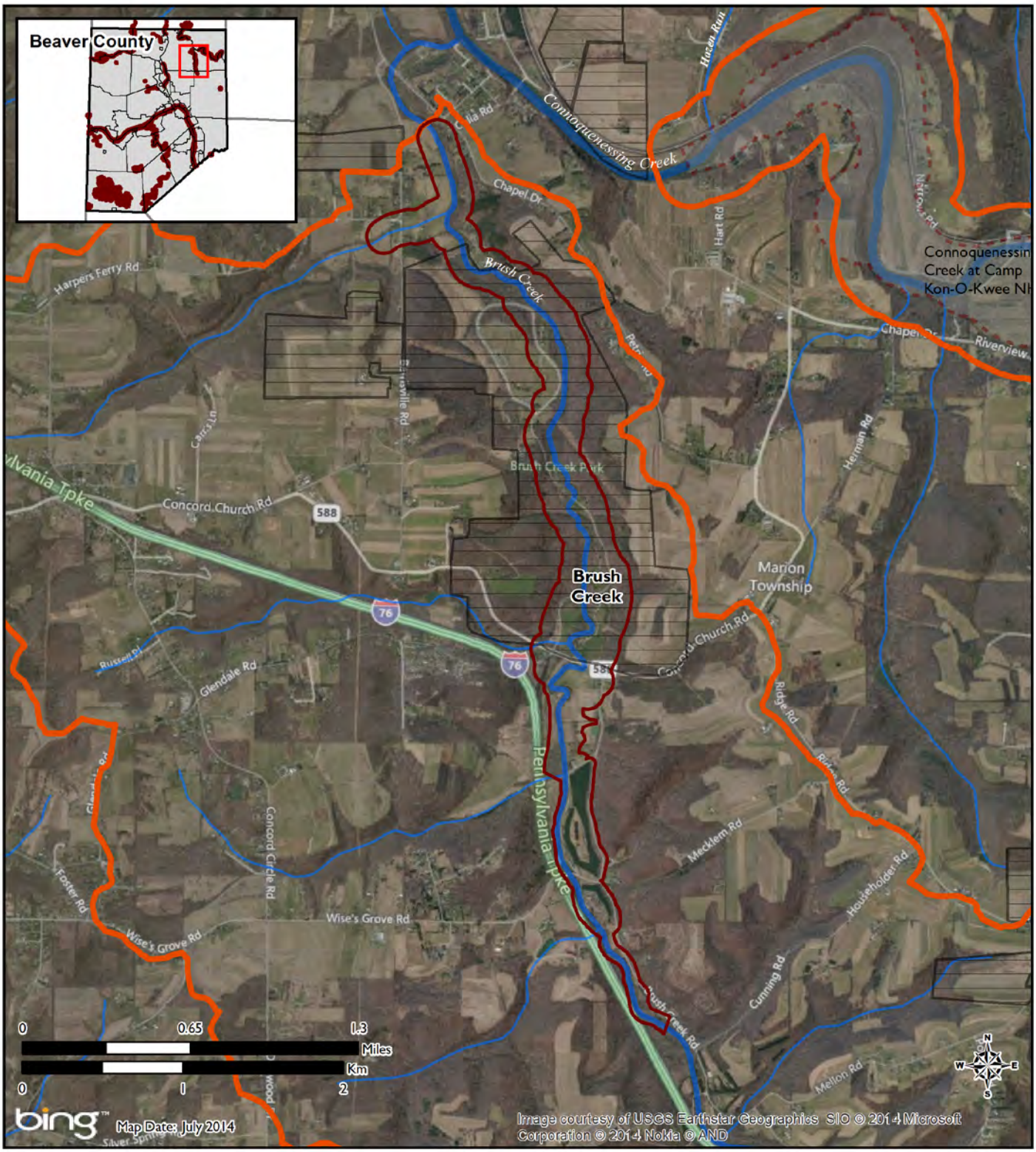
- Conserve the forested riparian buffers of all streams and wetlands. Conserve at least a 100 meter (328 feet) buffer of native woody vegetation where it exists along the waterways and establish at least a 30 meter (100 foot) buffer where it is lacking to help reduce erosion, sedimentation, and pollution. Additionally, best management practices (BMPs) that focus on limiting the introduction of non-point sources of pollution into surface and groundwater should be applied to the surrounding area. The forested buffers at this site are minimal in some places, and could be improved.

Location

Municipalities: *Beaver County: Franklin Township, Marion Township, New Sewickley Township, North Sewickley Township*
USGS quads: Beaver Falls, *Zelienople*
Previous CNHI reference: *Camp Kon-o-kwee Floodplain*
Associated NHAs: *None*
Overlapping Protected Lands: *Camp Kon-o-kwee Floodplain*

Pete Woods, PNHP

A mating pair of blue-tipped dancers. The male is above, the female below.



Brush Creek
Natural Heritage Area

Riparian habitat along Brush Creek supports a sensitive species of concern and a population of blue-tipped dancer, a damselfly species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Core Habitat***
- ***Other Supporting Landscape***
- ***Conservation Lands***

Confluence Slope NHA

PNHP Significance Rank: *State*

Site Description

This site is a maturing forest on the slopes above the Beaver River, which supports a population of **purple rocket**, a delicate herb in the mustard family. The soils are rich in calcium, and the diverse flora supports calciphilic plants such as plantain-leaved sedge (*Carex plantaginea*), maidenhair fern (*Adiantum pedatum*), and alum root (*Heuchera americana*

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name	PNHP Rank[1] Global	State	PA Legal Status[1]	Last Seen	Quality[2]
Purple Rocket (*Iodanthus pinnatifidus*)	G5	S1	PE (PE)	6/11/2006	BC

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.
[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.
[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Threats and Stresses

This population of purple rocket has declined to very low levels in recent years, for unknown reasons. A railroad and a trail built on an old railroad bed pass through the site, and nearby parts of the slope were quarried in the past

Pete Woods, PNHP

Purple rocket

Specific threats and stresses to the elements present at this site include the following:

- Exotic invasive plant species can grow densely and exclude native species. Garlic mustard (*Alliaria petiolata*) and dame's rocket (*Hesperis matronalis)* are well-established at the site and may be starting to exclude the species of concern. Multiflora rose (*Rosa multiflora*) and tree of heaven (*Ailanthus altissima*) are present at lower density.
- This species may grow best when the canopy is somewhat open. The maturing of the forest and the closing of the canopy may have led to the decline of the species at this site.

Conservation Recommendations

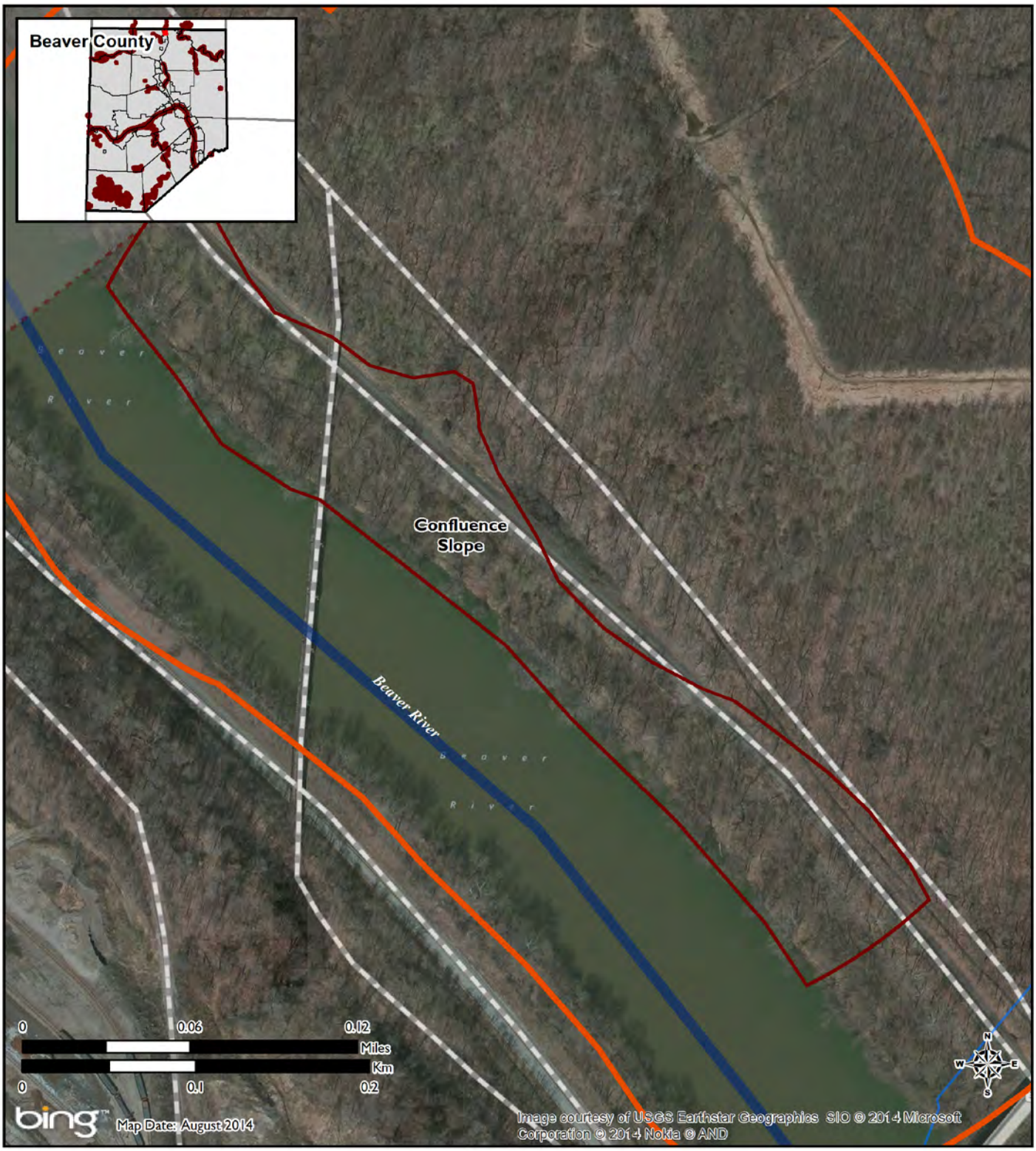
The following steps are recommended to ensure the persistence of these species at this site:

- Invasive plant species at this site should be controlled. Removal of garlic mustard and dame's rocket by hand is effective if efforts are sustained.

- Thinning of the canopy here might help the population rebound from its decline. If the canopy is opened, extra care must be taken to control invasive plants, which will also respond to the increased light levels.

Location

Municipalities: *Beaver County: North Sewickley Township*
USGS quads: *Beaver Falls*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Confluence Slope Natural Heritage Area

This stretch of slope along the Beaver River supports a population of purple rocket, an endangered plant species in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Core Habitat***
- ***Other Supporting Landscape***

Connoquenessing Creek at Camp Kon-O-Kwee NHA

PNHP Significance Rank: *State*

Site Description

This site is centered on aquatic habitat and floodplain forest along a stretch of Connoquenessing Creek. The floodplain forest is dominated by silver maple (*Acer saccharinum*) with the most common herbaceous plants including wingstem (*Vebesina alternifolia*), stinging nettle (*Urtica dioica*), garlic mustard (*Alliaria petiolata*), and reed canary grass (*Phalaris arundinacea*). The floodplain contains a number of vernal pools, which support populations of fairy shrimp and perhaps other vernal pool obligate species. Overall, the floodplain has a moderate level of diversity and provides habitat for several species of concern, but the forest is fairly fragmented and numerous invasive plant species are present. Upland forests above the creek and floodplain are rich with calcium, ranging from mesic forest dominated by sugar maple and basswood to drier oak-dominated forests higher on the slopes.

Pete Woods, PNHP

A midland clubtail, perching next to the shell of an Asian clam on the banks of the Connoquenessing.

Little is known about the life cycle or host plant of the **shiny gray carpet moth** (*Stamnodes gibbicostata*), except that it occurs in forests. **Silvery checkerspots** (*Chlosyne nycteis*) depend on wingstem (*Verbesina alternifolia*) as the host plant for their caterpillars. Wingstem is abundant in the floodplain forests and open edges of the riparian corridor. The creek supports the **blue-tipped dancer** and the **dusky dancer** (two damselflies of concern) and the **midland clubtail** (a dragonfly species of concern). The creek and forest also support a **sensitive species of concern**, which cannot be named here at the request of the jurisdictional agency overseeing its protection.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Blue-tipped Dancer (*Argia tibialis*)		G5	S2	N (N)	6/20/2013	AC
Dusky Dancer (*Argia translata*)		G5	S3S4	N (N)	6/20/2013	E
Midland Clubtail (*Gomphus fraternus*)		G5	S2S3	N (N)	6/20/2013	AC
Silvery Checkerspot (*Chlosyne nycteis*)		G5	S3S4	N (N)	6/20/2013	AC
Shiny Gray Carpet Moth (*Stamnodes gibbicostata*)		G4	SU	N (N)	9/11/2013	AC
Sensitive species of concern A[3]	S	---	---	---	2009	E

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Threats and Stresses

Specific threats and stresses to the elements present at this site include the following:

- Degradation of water quality or quantity can have a negative impact on the habitat supporting the species of concern found at this location. The stormwater runoff from roadways, suburban development, and agriculture should be considered a potential source of significant contamination for the wetland habitat. Runoff from these sources has significantly higher levels of sediment, nutrients, pesticides, herbicides, and other pollutants than runoff filtered through a natural habitat. Dragonflies, damselflies, and the sensitive species of concern rely on good water quality and are vulnerable to siltation and chemical pollution.
- Preserve and expand the forested riparian buffer along the creek edge while avoiding planting trees in wet meadow areas. Forested zones along waterways help filter runoff from roads, residences, and agricultural areas, removing many contaminants contained in the runoff before it enters larger streams and rivers. Forested creek edges also slow the speed and force of runoff, allowing the water to percolate into the groundwater.
- Riparian forests at this site are fragmented. Further fragmentation due to development or infrastructure activities can result in habitat loss and degradation of the site.
- The sensitive species of concern is vulnerable to human disturbance. Significant additional human disturbance within 1000 feet (305 meters) could trigger permanent abandonment of the area.
- Numerous invasive plants are present, in some cases reaching high densities. Invasives at this site include garlic mustard (*Alliaria petiolata*), multiflora rose (*Rosa multiflora*), Oriental bittersweet (*Celastrus orbiculatus*), dames rocket (*Hesperis matronalis*), Japanese stilt grass (*Microstegium vimineum*), and Japanese knotweed (*Polygonum cuspidatum*). Left to spread, these species will crowd out native plants and the species that rely on them.

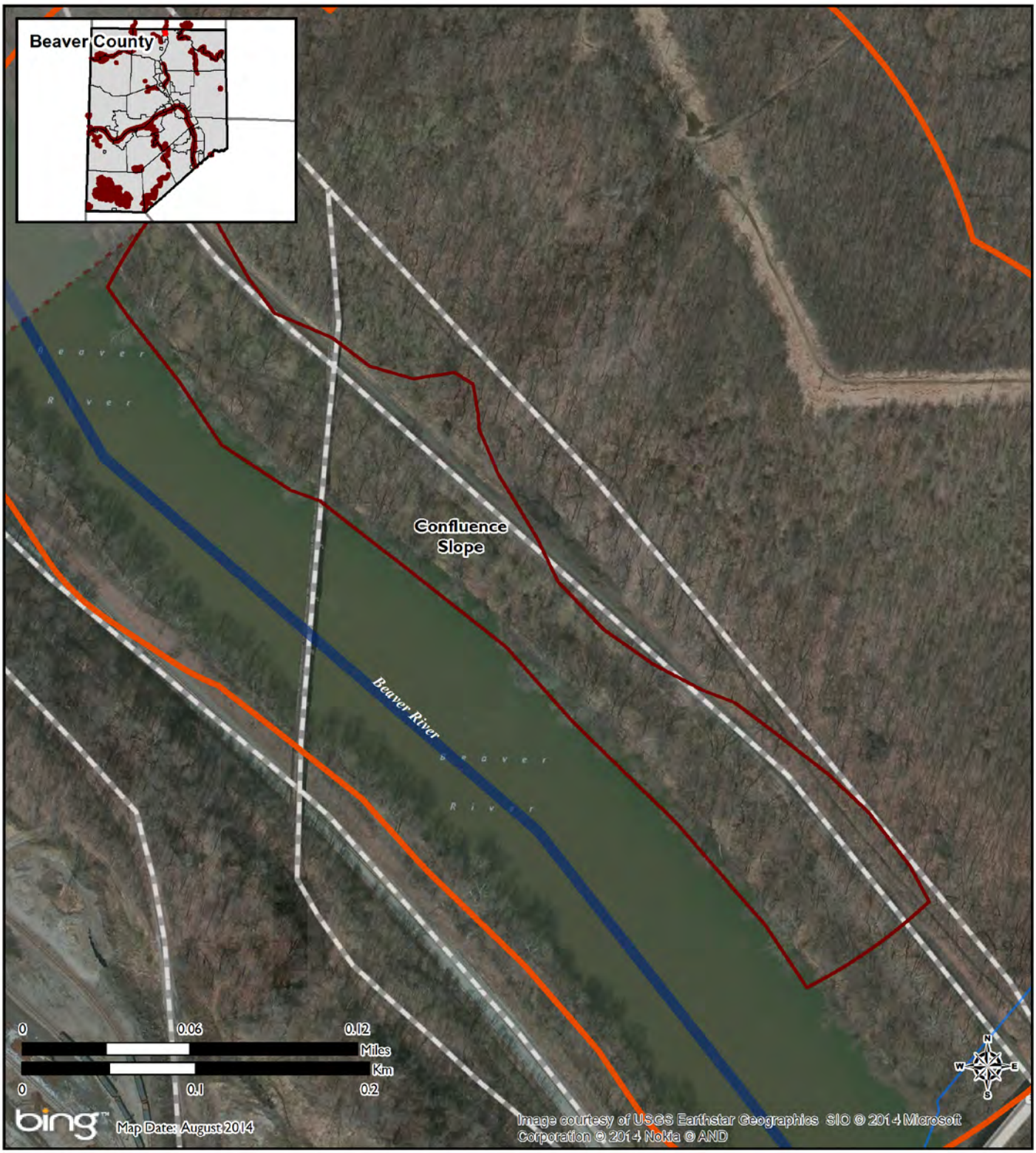
Conservation Recommendations

The following steps are recommended to ensure the persistence of these species at this site:

- Establish at least a 100 foot (30 meter) buffer of woody vegetation along streams to help reduce erosion, sedimentation, and pollution. Streams through non-forested areas should be restored with native trees and shrubs appropriate to the habitat.
- Conserve and expand forested riparian buffers. Streams through forested areas should be considered high priority for conservation. The forested riparian corridor helps regulate stream temperature and creates streamside conditions contributing to improved water quality and aquatic habitat.
- Best management practices (BMPs) that focus on limiting the introduction of non-point sources of pollution into surface and groundwater should be applied to the surrounding area. Maintaining high quality aquatic habitat is important to this species.
- Additional development within the Core Habitat should be avoided to protect the sensitive species of concern. Avoid fragmenting the existing forested areas with additional buildings or infrastructure. The primary conservation concern for this habitat should be to focus on safeguarding the quality and expanse of the natural landscape. While providing the primary habitat for the populations of species of concern, the natural landscape also helps to protect water quality of the streams that drain through this NHA.
- Avoid disturbance from human activities within the Core Habitat during the breeding season of the sensitive species of concern (December – July).
- Control invasive species of plants to prevent native species from being crowded out by introduced species. Sustained invasive species monitoring and control will be necessary.

Location

Municipalities: *Beaver County: Franklin Township, Marion Township, New Sewickley Township, North Sewickley Township*
USGS quads: *Zelienople*
Previous CNHI reference: *Camp Kon-o-kwee Floodplain*
Associated NHAs: *None*
Overlapping Protected Lands: *Camp Kon-o-kwee Floodplain*



Confluence Slope Natural Heritage Area

This stretch of slope along the Beaver River supports a population of purple rocket, an endangered plant species in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- **Supporting Landscape**
- ***Other Core Habitat***
- ***Other Supporting Landscape***

Connoquenessing Creek at Ellwood City NHA

PNHP Significance Rank: *State*

Site Description

Connoquenessing Creek NHA includes portions of its namesake creek where it empties into the Beaver River and several tributaries. This stretch of Connoquenessing Creek maintains high mussel biodiversity, due to the tributaries providing refugia for several species. The mussel populations here includes **three mussel species of concern**, and the creek also supports **a sensitive species of concern** . There are steep forested slopes between residential developments and the creek along the western banks south of Elwood City.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Three-ridge Mussel (*Amblema plicata*)		G5	S2S3	N (PT)	8/11/2002	E
Round Pigtoe (*Pleurobema sintoxia*)		G4G5	S2	N (PE)	8/11/2002	E
Purple Rocket (*Iodanthus pinnatifidus*)		G5	S1	PE (PE)	6/1/1968	H
Sensitive species of concern A[3]	S	---	---	---	2011	E

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Threats and Stresses

Much of the area around Connoquenessing Creek NHA is under agricultural use, low to medium density residential developments, industrial developments, and public recreation areas.

Specific threats and stresses to the elements present at this site include the following:

- Excess loose particles and sedimentation can change the water composition of sites
- Runoff waters from agricultural fields may contain pesticides and herbicides harmful to native plant and animal species.
- Chloride-based salts (sodium chloride, magnesium chloride, potassium chloride, etc.) can have detrimental impacts on vegetation, soil composition, and aquatic life.
- Roads, buildings, and other infrastructures may alter a site's natural buffers, leaving them fragmented and vulnerable.
- Dredging

Conservation Recommendations

Connoquenessing Creek has a long history of human-related disturbance and manipulation. These activities reduce the water quality and have an impact on biodiversity. The high mussel diversity within the Connoquenessing Creek NHA indicates that water quality is improving in the region. Continued efforts to maintain and improve the water

PNHP

Three-ridge Mussel *(Amblema plicata)*

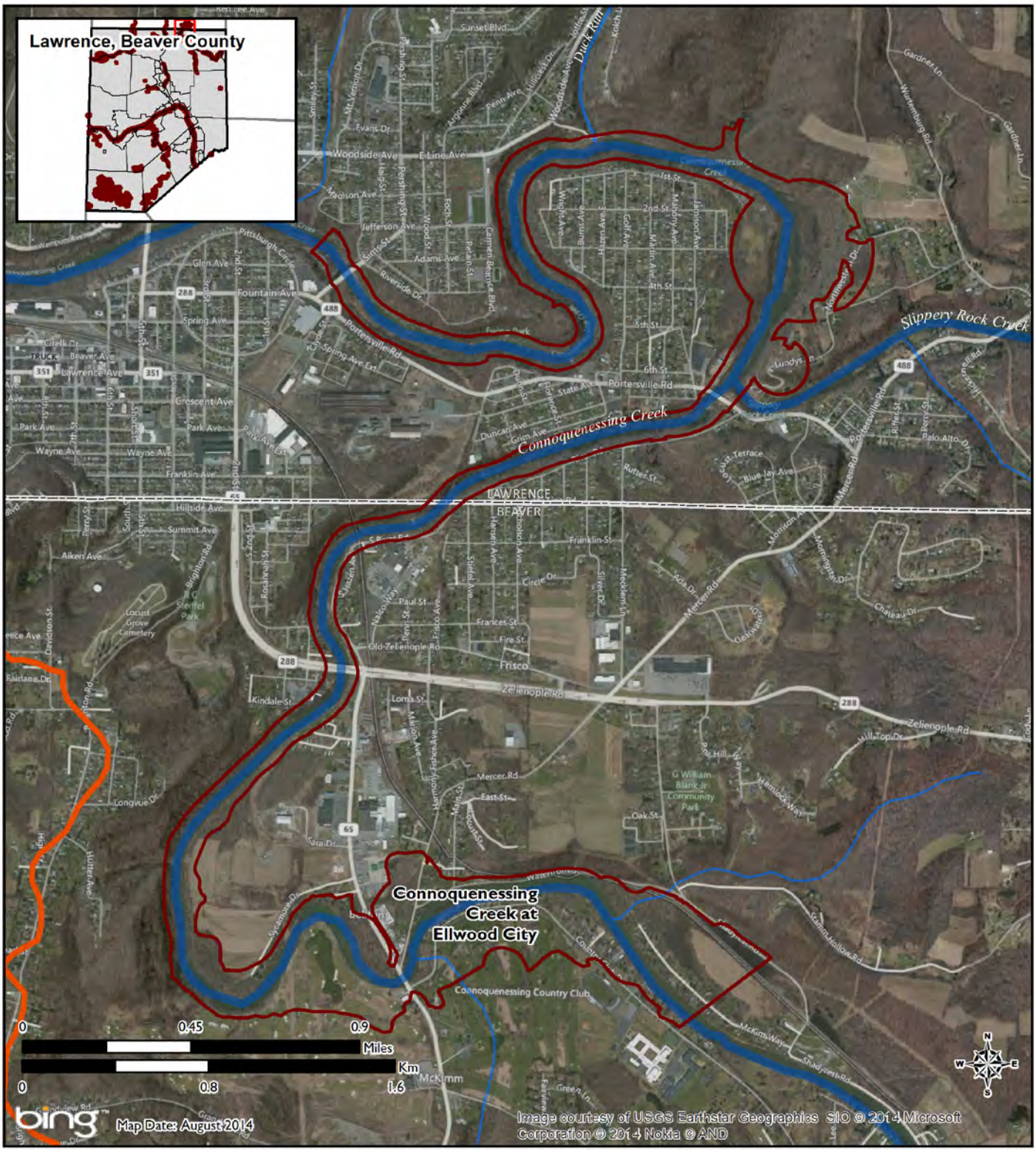
quality recommended ensuring high biodiversity at this site.

The following steps are recommended to ensure the persistence of these species at this site:

- Maintain and rebuild floodplains and forest buffers to stabilize ground composition and prevent excess sedimentation from washing into waterways.
- Alternative road de-icing agents such as calcium magnesium acetate are less environmentally harmful than chloride salts and should be used when possible. Managing runoff from roads will also limit harmful chemical effects.
- Maintain and rebuild vegetation buffers and infrastructures. Remove or relocate buildings and other man-made structures with age.

Location

Municipalities: *Beaver County: Ellwood City Borough, Franklin Township, North Sewickley Township; Lawrence County: Ellport Borough, Ellwood City Borough, Perry Township, Wayne Township*
USGS quads: *Beaver Falls*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Connoquenessing Creek at Ellwood City Natural Heritage Area

Aquatic and riparian habitat supports populations of two mussels of concern: round pigtoe and three-ridge mussel, and a plant species of concern, purple rocket, as well as a sensitive species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas
- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Supporting Landscape***

Darlington Swamp and North Fork Little Beaver Creek NHA

PNHP Significance Rank: *State*

Site Description

Darlington Swamp and North Fork Little Beaver Creek, along with the adjacent uplands, supports the **blue-tipped dancer (**a damselfly species of concern), the **yellow water-crowfoot**, a **bottomland oak-hardwood palustrine forest**, as well as **one sensitive species of concern**, which cannot be named at the request of the jurisdictional agency overseeing its protection.

North Fork Little Beaver Creek is a low to moderate gradient stream. It has had a history of problems with abandoned mine drainage, although many of the worst discharges have been remedied through the installation of treatment systems. Much of the floodplains along this creek have been converted to agriculture and residential developments.

Records could not be updated because landowner permission could not be obtained.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Blue-tipped Dancer (*Argia tibialis*)		G5	S2	N (N)	7/12/2013	AC
Yellow Water-crowfoot (*Ranunculus flabellaris*)		G5	S2	N (PT)	9/8/1992	E
Bottomland Oak - Hardwood Palustrine Forest	C	GNR	S2	N (N)	9/8/1992	E
Sensitive species of concern A[3]	S	---	---	---	7/24/2012	E

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Threats and Stresses

Maintaining suitable aquatic habitat is crucial to the continued success of the aquatic species of concern. Runoff from dirt and gravel roads in close proximity to waterways can contribute to physical degradation of their channels and erosion and sediment pollution in streams and rivers. Loss of forest cover within the core areas may also result in increased water temperatures and disruption of natural nutrient cycling linked to the river. If forest cover is substantially reduced within the watersheds, water quality is likely to decline from increased sediment loads. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events.

Specific threats and stresses to the elements present at this site include the following:

- Damselflies rely on good water quality, although the tolerances of individual species to different types of pollution are not well-understood. The sensitive species of concern is also vulnerable to water quality degradation. Erosion, whether caused by deforestation, poor agricultural practices, or the destruction of riparian zones, leads to increased silt loads and shifting, unstable stream bottoms. Siltation and contaminants such as heavy metals, pesticides, and abandoned mine drainage are potential threats to this species.

- Exotic invasive plant species threaten to compete with and displace native species. Numerous invasive species are present in this part of the North Fork Little Beaver Creek valley. Among the most abundant are Japanese knotweed (*Polygonum cuspidatum*), garlic mustard (*Alliaria petiolata*), dame's rocket (*Hesperis matronalis*), multiflora rose (*Rosa multiflora*), and barberry (*Berberis thunbergii*).

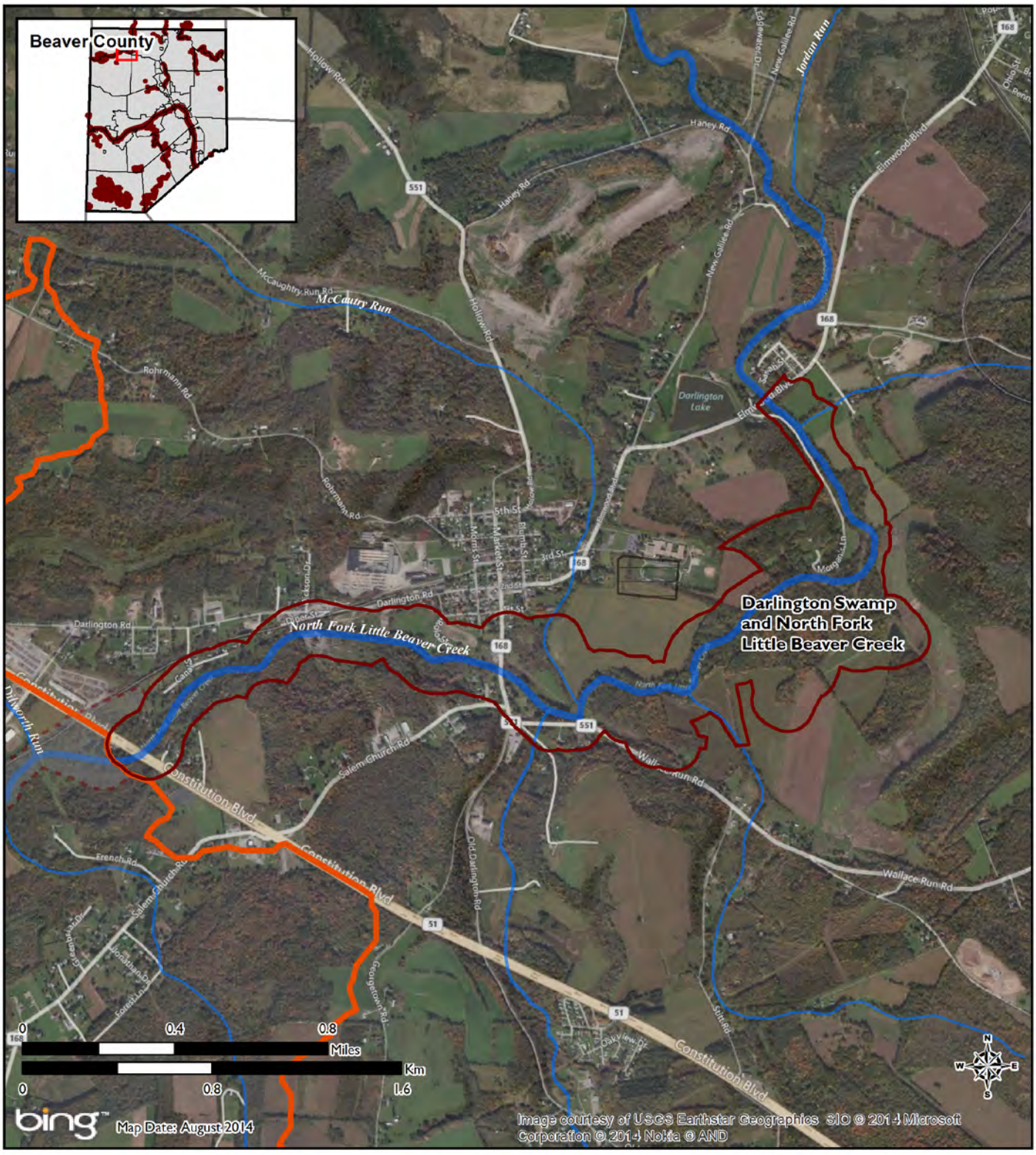
Conservation Recommendations

The following steps are recommended to ensure the persistence of these species at this site:

- Conserve the forested riparian buffers of all streams and wetlands. Conserve at least a 100 meter (328 feet) buffer of native woody vegetation where it exists along the waterways and establish at least a 30 meter (100 foot) buffer where it is lacking to help reduce erosion, sedimentation, and pollution. The forested buffers at this site are minimal in some places, and could be improved.
- Best management practices (BMPs) that focus on limiting the introduction of non-point sources of pollution into surface and groundwater should be applied to the surrounding area.
- Avoid fragmenting the remaining forested areas with additional buildings or infrastructure. The primary conservation concern for this habitat should be to focus on safeguarding the quality and expanse of the natural landscape. While providing the primary habitat for the populations of species of concern, the natural landscape also helps to protect water quality of North Fork Little Beaver Creek.
- Control invasive species of plants to prevent native species from being crowded out by introduced species. Continuing invasive species monitoring and control will be necessary.

Location

Municipalities: *Beaver County: Big Beaver Borough, Darlington Borough, Darlington Township, South Beaver Township*
USGS quads: *New Galilee*
Previous CNHI reference: *Darlington NA, Darlington Road Wetlands*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Darlington Swamp and North Fork Little Beaver Creek Natural Heritage Area

Riparian habitat along North Fork Little Beaver Creek includes a state rare Bottomland Oak - Hardwood Palustrine Forest and supports several species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Core Habitat***
- ***Other Supporting Landscape***
- ***Conservation Lands***

Doe Run Woods NHA

PNHP Significance Rank: *State*

Site Description

This site is centered on a section of riparian forest along an oxbow of Brush Creek, between Glen Eden Road and the Pennsylvania Turnpike. The oxbow was created when the construction of the turnpike cut off a loop of Brush Creek. This riparian forest and adjacent lands support a **sensitive species of concern**.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	State	PA Legal Status[1]	Last Seen	Quality[2]
Sensitive species of concern A[3]	**S**	---	---	---	4/5/2013	E

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Threats and Stresses

Specific threats and stresses to the elements present at this site include the following:

- The sensitive species of concern is vulnerable to human disturbance. Significant additional human disturbance within 1000 feet (305 meters) could trigger permanent abandonment of the area. The species appears to be habituated to the current levels of turnpike traffic and other human activities, but any extreme events or increase in activity or noise could cause abandonment.
- The species of concern at this site rely on good water quality, and are vulnerable to siltation and chemical pollution.

Conservation Recommendations

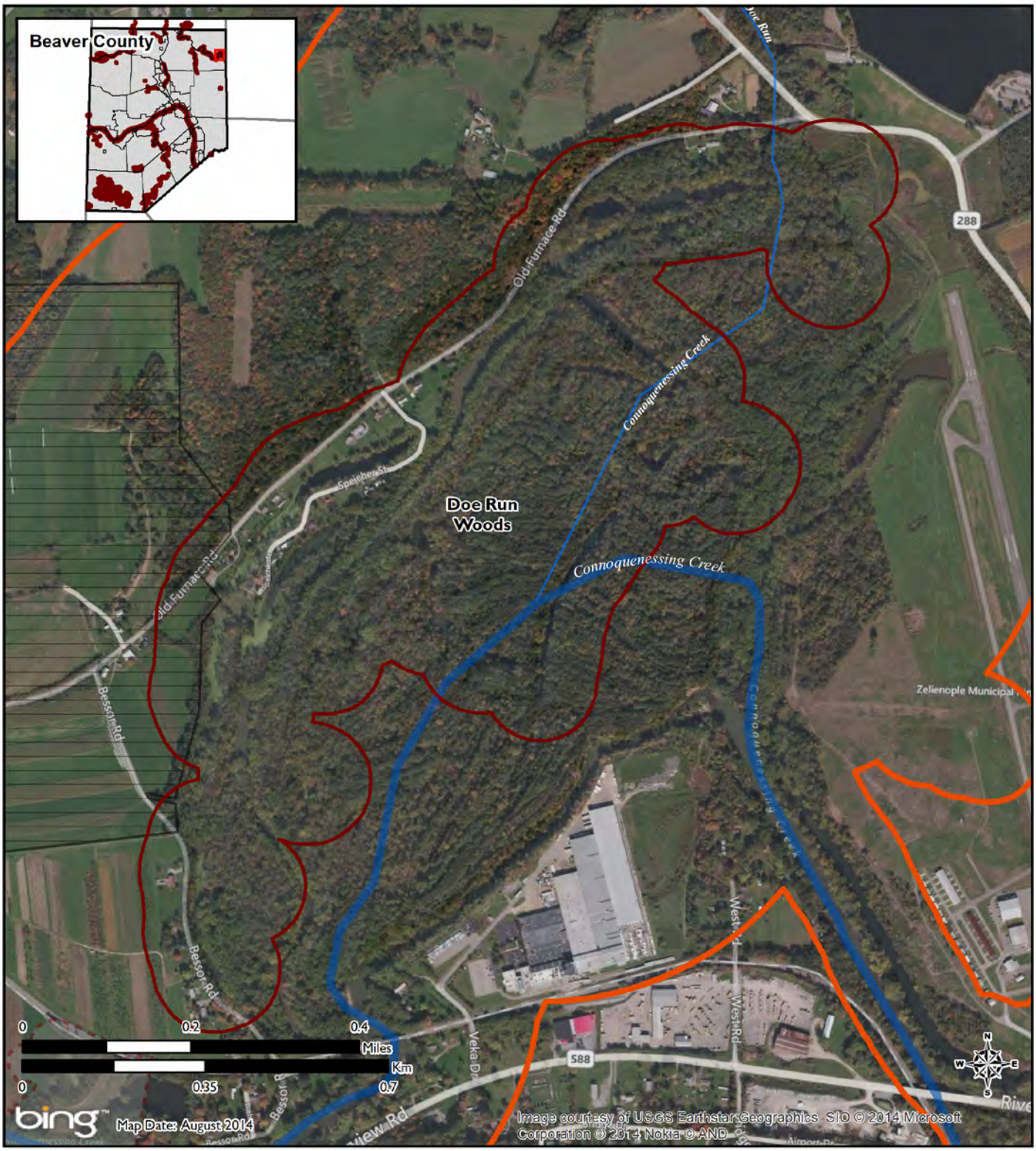
Additional development within the Core Habitat should be avoided to protect the sensitive species of concern. Disturbance within the Core Habitat should not be a problem for this species if it occurs during non-breeding season (September – February).

The following steps are recommended to ensure the persistence of these species at this site:

- Avoid or minimize human disturbance to the Core Habitat during the March through August breeding season.
- Maintain at least a 100 foot (30 meter) buffer of woody vegetation along streams to help reduce erosion, sedimentation, and pollution. Nearby streams through non-forested areas should be restored with native trees and shrubs appropriate to the habitat.
- Additionally, best management practices (BMPs) that focus on limiting the introduction of non-point sources of pollution into surface and groundwater should be applied to the surrounding area
- Avoid fragmenting the existing forested areas with additional buildings or infrastructure.

Location

Municipalities: *Beaver County: Franklin Township, Marion Township*
USGS quads: *Zelienople*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Doe Run Woods
Natural Heritage Area

Forests along this oxbow tributary to Connequenessing Creek support a sensitive species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Core Habitat***
- ***Other Supporting Landscape***

Hanover Slope NHA

PNHP Significance Rank: *State*

Site Description

This roadside slope supports a small population of **vase-vine leather flower**. The small size of the population and the roadside location makes the viability of this population questionable, but with careful management this population could become more secure.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name	PNHP Rank[1] Global	State	PA Legal Status[1]	Last Seen	Quality[2]
Vase-vine Leather-flower (*Clematis viorna*)	G5	S1	PE (PE)	8/14/1996	D

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.
[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

Threats and Stresses

Specific threats and stresses to the elements present at this site include the following:

- Roadside herbicide spraying could extirpate this population
- Invasive plants, common along roads, are a potential threat.

Tom Potterfield

Vase-vine leather-flower in bloom

Conservation Recommendations

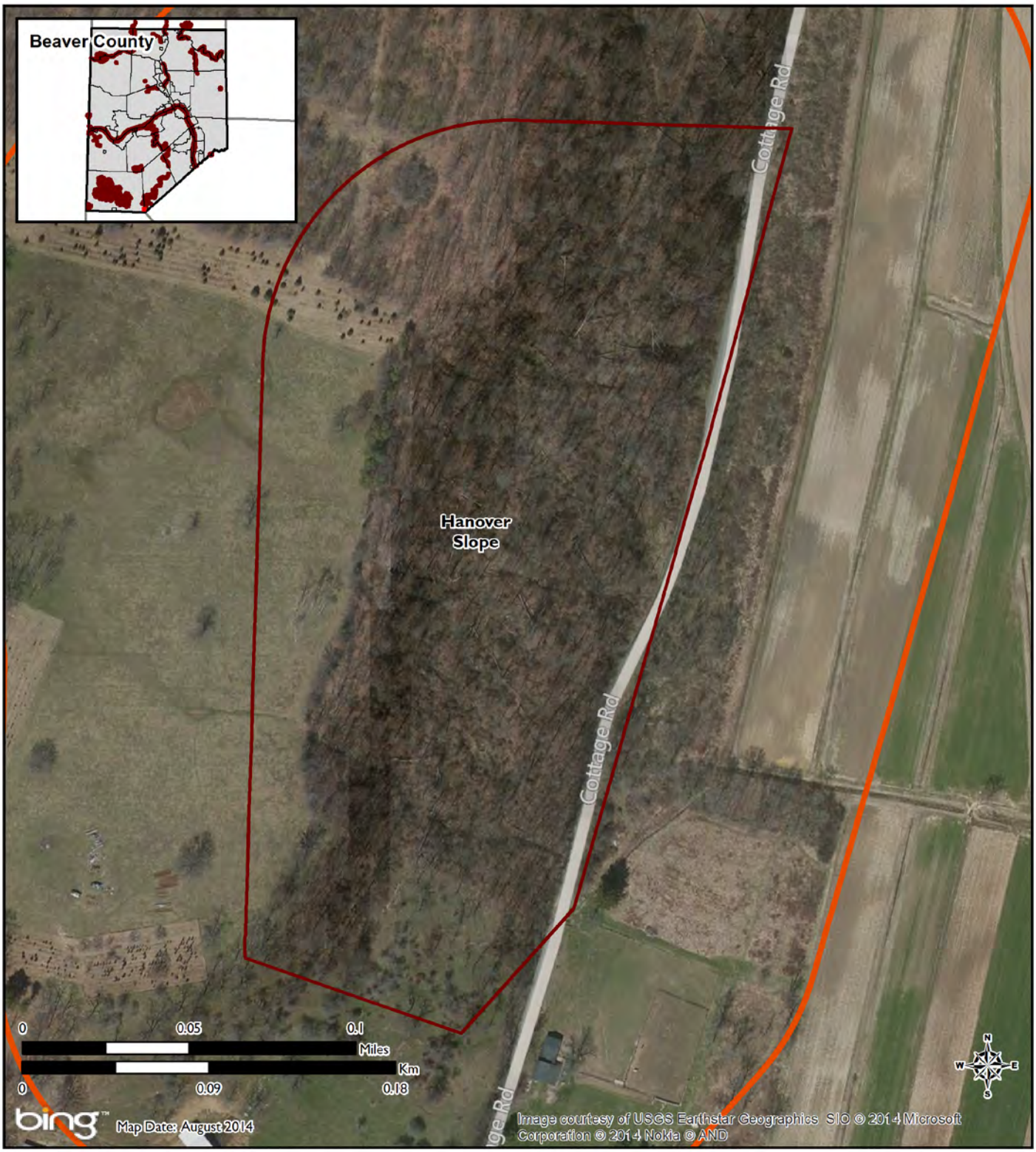
This site is entirely on private property, with no conservation easements in place.

The following steps are recommended to ensure the persistence of these species at this site:

- Avoid spraying herbicide for roadside vegetation control.
- Monitor for invasive plant species and control them if present.

Location

Municipalities: *Beaver County: Hanover Township, Independence Township*
USGS quads: *Clinton*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Hanover Slope
Natural Heritage Area

A forested slope supports a population of vase-vine leather-flower, an endangered plant species in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas
- ***Core Habitat***
- **Supporting Landscape**
- ***Other Supporting Landscape***

Lower Raccoon Creek NHA

PNHP Significance Rank: *State*

Site Description

The lower reaches of Raccoon Creek, along with the adjacent uplands, supports the **blue-tipped dancer** (a damselfly species of concern) as well as **two sensitive species of concern**, which cannot be named at the request of the jurisdictional agencies overseeing their protection.

Raccoon Creek is a fourth-order stream, with a low to moderate gradient. It has had a history of problems with abandoned mine drainage, although many of the worst discharges have been remedied through the installation of treatment systems. Freshwater mussels were once present in the creek, but no live mussels have been found in many decades. Conditions might now be appropriate for mussels to return, but it will take time for them to recolonize the creek from the Ohio River.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Blue-tipped Dancer (*Argia tibialis*)		G5	S2	N (N)	6/18/2013	AC
Sensitive species of concern A[3]	S	---	---	---	9/9/1997	E
Sensitive species of concern B[3]	S	---	---	---	7/5/2012	E

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Threats and Stresses

Aquatic life was declining in Raccoon Creek by 1908 (Ortmann 1909), and in 1924 coal mine drainage killed what aquatic life remained (Henrici, 1951). In recent years many of the worst discharges have been remedied through the installation of treatment systems.

Pete Woods, PNHP

A riffle on Raccoon Creek at the Rocky Bottom Natural Area.

Maintaining suitable aquatic habitat is the key to the continued success of the aquatic species of concern. Runoff from dirt and gravel roads in close proximity to waterways can contribute to physical degradation of their channels and erosion and sediment pollution in streams and rivers. Loss of forest cover within the core areas may also result in increased water temperatures and disruption of natural nutrient cycling linked to the river. If forest cover is substantially reduced within the watersheds, water quality is likely to decline from increased sediment loads. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events.

Specific threats and stresses to the elements present at this site include the following:

- Damselflies rely on good water quality, although the tolerances of individual species to different types of pollution are not well-understood. Both sensitive species of concern are also vulnerable to water quality degradation. Erosion, whether caused by deforestation, poor agricultural practices, or the destruction of riparian zones, leads to increased silt loads and shifting, unstable stream bottoms. Siltation and contaminants such as heavy metals, pesticides, and abandoned mine drainage are potential threats to these species.
- Exotic invasive plant species threaten to compete with and displace native species. Numerous invasive species are present in this part of the Raccoon Creek valley. Among the most abundant are Japanese knotweed (*Polygonum cuspidatum*), garlic mustard (*Alliaria petiolata*), dame's rocket (*Hesperis matronalis*), multiflora rose (*Rosa multiflora*), and barberry (*Berberis thunbergii*).

Conservation Recommendations

This site includes Rocky Bottom Natural Area, owned and protected by the Independence Conservancy.

The following steps are recommended to ensure the persistence of these species at this site:

- Conserve the forested riparian buffers of all streams and wetlands. Conserve at least a 100 meter (328 feet) buffer of native woody vegetation where it exists along the waterways and establish at least a 30 meter (100 foot) buffer where it is lacking to help reduce erosion, sedimentation, and pollution. The forested buffers at this site are minimal in some places, and could be improved.
- Best management practices (BMPs) that focus on limiting the introduction of non-point sources of pollution into surface and groundwater should be applied to the surrounding area.
- Avoid fragmenting the remaining forested areas with additional buildings or infrastructure. The primary conservation concern for this habitat should be to focus on safeguarding the quality and expanse of the natural landscape. While providing the primary habitat for the populations of species of concern, the natural landscape also helps to protect the water quality of Raccoon Creek.
- Control invasive species of plants to prevent native species from being crowded out by introduced species. Continuing invasive species monitoring and control will be necessary.

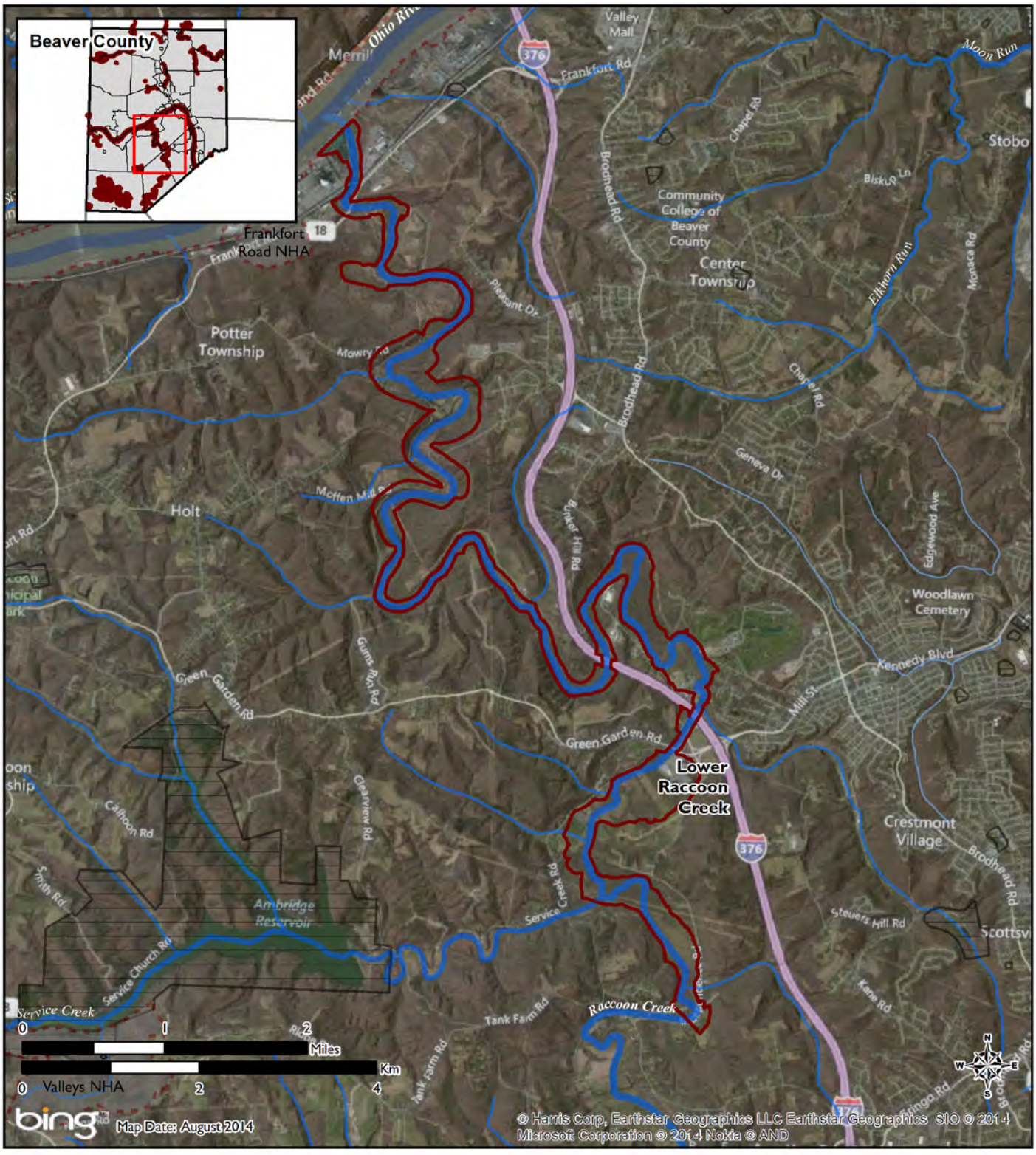
Location

Municipalities: *Beaver County: Center Township, Hopewell Township, Independence Township, Potter Township, Raccoon Township*
USGS quads: *Beaver, Aliquippa*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Rocky Bottom Natural Area*

References and Additional Reading

Read about the Rocky Bottom Natural Area and other lands preserved by the Independence Conservancy at:
http://www.independenceconservancy.org/services/land-conservation/preserved-lands

The Raccoon Creek Watershed Plan will be completed in 2014. Look for a link to it at the Independence Conservancy webpage: http://www.independenceconservancy.org/



Lower Raccoon Creek Natural Heritage Area

Aquatic and riparian habitat along Lower Raccoon Creek supports the blue-tipped dancer, a damselfly species of concern, bluebreast darter, a fish species of concern, and one sensitive species of concern.

Significance Rank:
STATE

Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Core Habitat***
- ***Other Supporting Landscape***
- ***Conservation Lands***

Mill Creek in Beaver County NHA

PNHP Significance Rank: *State*

Site Description

The stretch of Mill Creek, along with the adjacent uplands, supports a **sensitive species of concern**, which cannot be named here at the request of the jurisdictional agency overseeing its protection.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Sensitive species of concern A[3]	**S**	---	---	---	6/5/2013	E

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Threats and Stresses

Little Blue Run coal ash impoundment, the largest impoundment of its kind in the United States, is immediately adjacent to this watershed. The reservoir has been filled to capacity with semi-solid waste from burning coal, and disposal is expected to end in 2016. Groundwater near the reservoir has been contaminated with arsenic and other pollutants (Hopey 2014). Since the surface of this impoundment is approximately 100 meters higher than Mill Creek, there is great potential for the polluted groundwater to move into Mill Creek, which would threaten the species of concern and other aquatic life.

Maintaining suitable aquatic habitat is crucial to the continued success of the species of concern. Runoff from dirt and gravel roads in close proximity to waterways can contribute to physical degradation of their channels and erosion and sediment pollution in streams and rivers. Loss of forest cover within the core areas may also result in increased water temperatures and disruption of natural nutrient cycling linked to the river. If forest cover is substantially reduced within the watersheds, water quality is likely to decline from increased sediment loads. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events.

Specific threats and stresses to the elements present at this site include the following:

- The sensitive species of concern relies on good water quality and is vulnerable to water quality degradation, although the tolerances to different types of pollution are not well-understood. Erosion, whether caused by deforestation, poor agricultural practices, or the destruction of riparian zones, leads to increased silt loads and shifting, unstable stream bottoms. Siltation and contaminants such as heavy metals, pesticides, and abandoned mine drainage are potential threats to these species.
- Exotic invasive plant species threaten to compete with and displace native species. Numerous invasive species are present in this part of the Raccoon Creek valley. Among the most abundant are Japanese knotweed (*Polygonum cuspidatum*), garlic mustard (*Alliaria petiolata*), dame's rocket (*Hesperis matronalis*), multiflora rose (*Rosa multiflora*), and barberry (*Berberis thunbergii*).

Conservation Recommendations

The following steps are recommended to ensure the persistence of these species at this site:

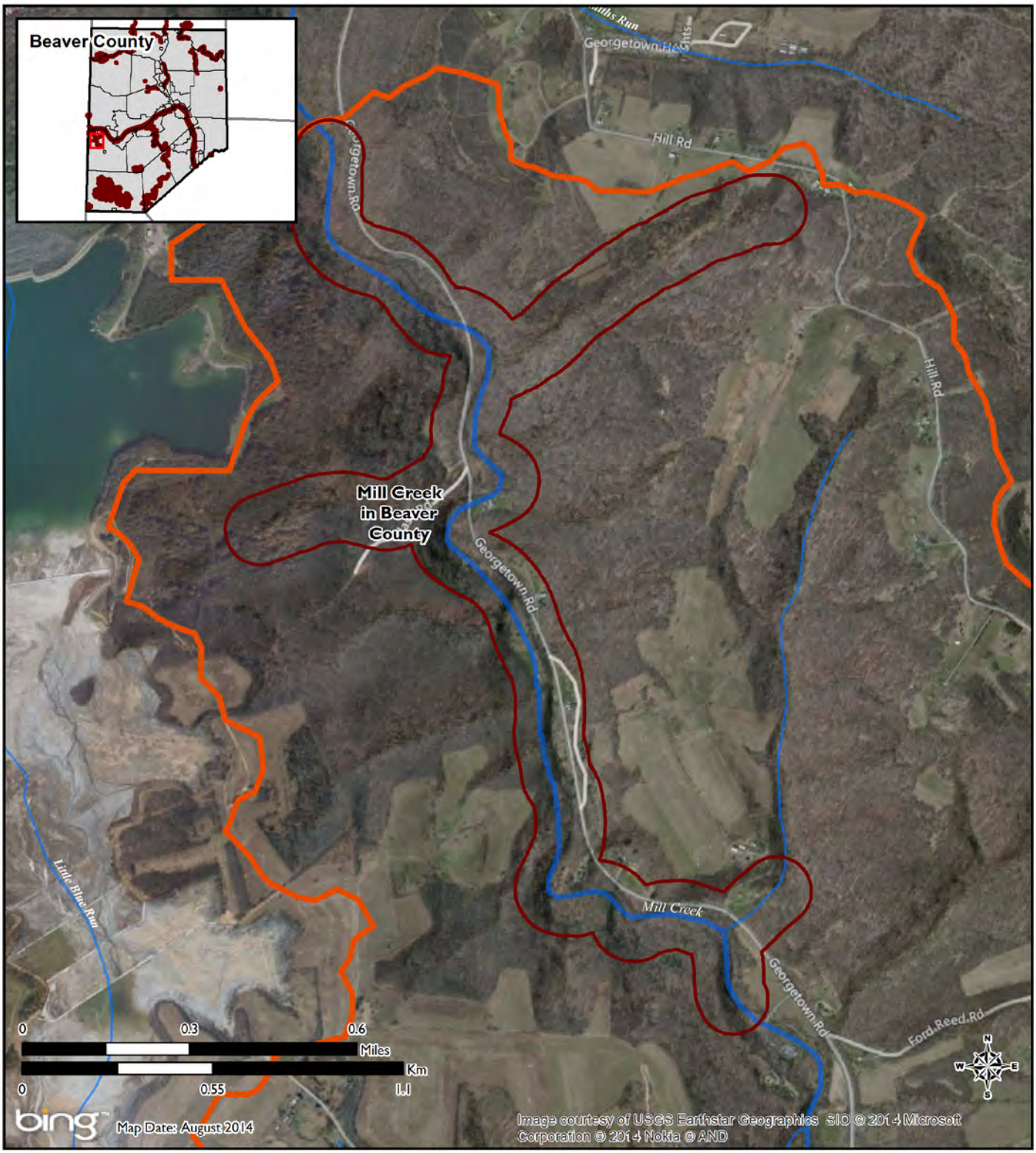
- Conserve the forested riparian buffers of all streams and wetlands. Conserve at least a 100 meter (328 feet) buffer of native woody vegetation where it exists along the waterways and establish at least a 30 meter (100 foot) buffer where it is lacking to help reduce erosion, sedimentation, and pollution. The forested buffers at this site are minimal in some places, and could be improved.
- Best management practices (BMPs) that focus on limiting the introduction of non-point sources of pollution into surface and groundwater should be applied to the surrounding area.
- Avoid fragmenting the remaining forested areas with additional buildings or infrastructure. The primary conservation concern for this habitat should be to focus on safeguarding the quality and expanse of the natural landscape. While providing the primary habitat for the populations of species of concern, the natural landscape also helps to protect the water quality of Mill Creek.
- Control invasive species of plants to prevent native species from being crowded out by introduced species. Continuing invasive species monitoring and control will be necessary.

Location

Municipalities: Beaver County: Greene Township
USGS quads: East Liverpool North, Midland, East Liverpool South, Hookstown
Previous CNHI reference: Mill Creek-beaver Co
Associated NHAs: None
Overlapping Protected Lands: Mill Creek-beaver Co

References and Additional Reading

Hopey, Don. 3 April 2014. "Little Blue Run coal ash site to close sooner: plant owner must contain pollution." Pittsburgh Post Gazette. Accessed at: http://www.postgazette.com/news/environment/2014/04/04/Coal-ash-site-to-close-sooner/stories/201404040080#ixzz37YSAVAyF.



Mill Creek in Beaver County Natural Heritage Area

Riparian habitat along Mill Creek supports a population of a sensitive species of concern.

Significance Rank:
STATE

Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Core Habitat***
- ***Other Supporting Landscape***

Monaca Bluffs NHA

PNHP Significance Rank: *Regional*

Site Description

The Monaca Bluffs are steep north- to northwest-facing slopes above the Ohio River. The upper slopes are quite dry, with the canopy dominated by red oak (*Quercus rubra*) and sassafrass (*Sassafrass albidum*). The understory is not diverse, but includes a few interesting plants. Dutchman's pipe (*Aristolochia macrophylla*, also known as Pipevine) is abundant throughout the site, and it hosts a large population of **pipevine swallowtails**, a butterfly species of concern. Wild bleeding heart (*Dicentra eximia*) is also abundant, even dominant, across much of the slope, and it is the main nectar source for the swallowtails. Although native populations of wild bleeding heart are endangered in Pennsylvania, PNHP considers this and other populations in Beaver County as introduced, because this species was not known from the area historically and this strain grows aggressively in disturbed forests.

Small ravines cut into the very steep lower slope; these moister habitats have a greater diversity of plants. These moist lower slopes are the habitat for **rock skullcap**, a globally rare plant. Rock skullcap has not been found in the most recent surveys here, and there is concern that it has been extirpated.

Pete Woods, PNHP

Pipevine swallowtail caterpillar and adult

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Pipevine Swallowtail (*Battus philenor*)		G5	S3	N (N)	7/3/2013	A
Rock Skullcap (*Scutellaria saxatilis*)		G3	S1	TU (PE)	6/4/1992	BC

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

Threats and Stresses

The intense development just above the slopes presents conservation challenges.

Specific threats and stresses to the elements present at this site include the following:

- The stores and parking lots above the slope make up an extensive impermeable surface, which prevents rainwater from infiltrating into the ground. Reduced groundwater levels could result in less moisture on the lower slopes, reducing habitat available for the rock skullcap.
- Exotic invasive plant species can grow densely and exclude native species. Japanese stiltgrass (*Microstegium vimineum*) is encroaching from near the parking lots, while tree of heaven (*Ailanthus altissima*) and Japanese knotweed (*Fallopia japonica*) are present at low density in the forest.

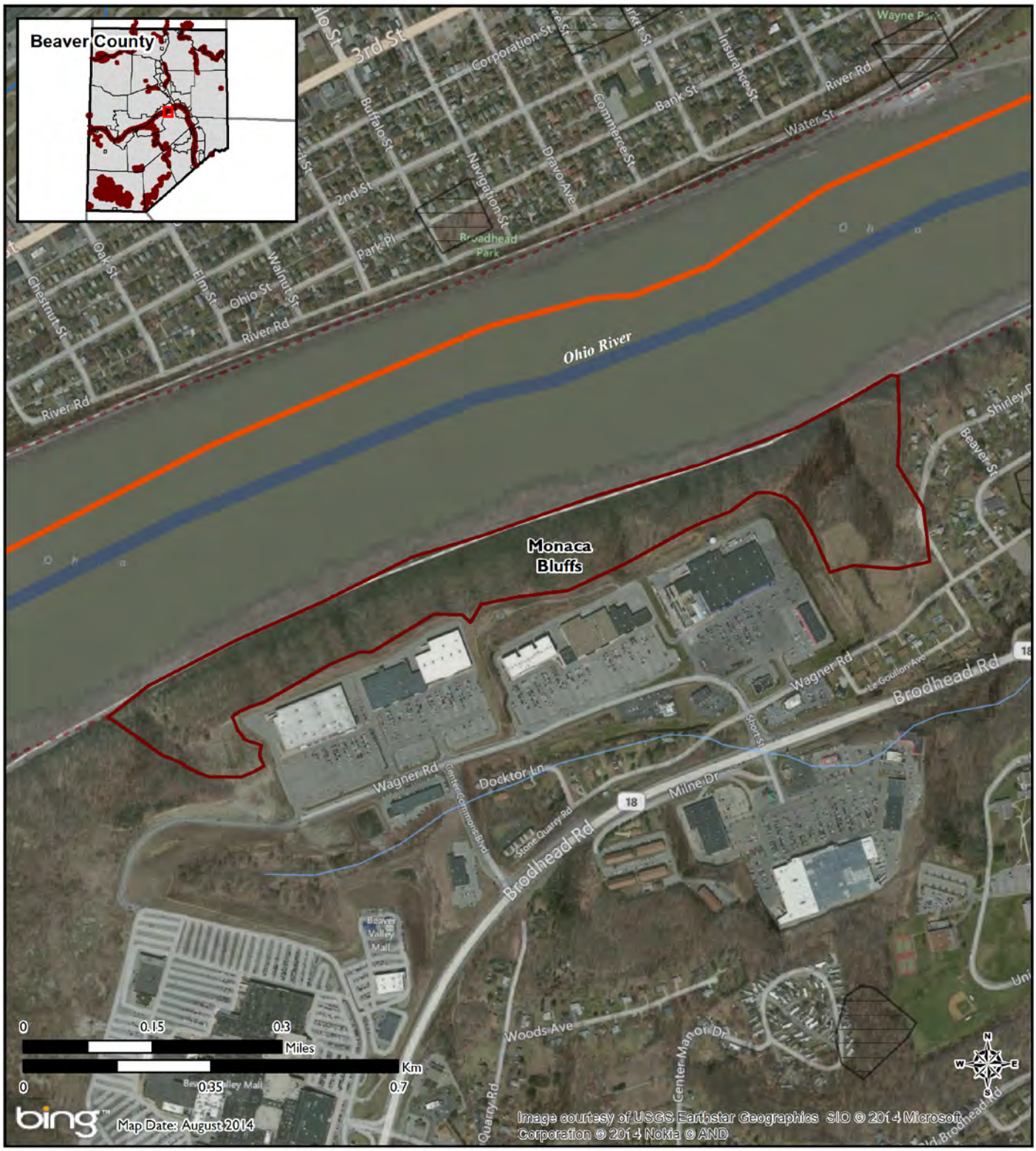
Conservation Recommendations

The following steps are recommended to ensure the persistence of these species at this site:

- Additional impervious surfaces should not be created above the bluffs without a better understanding of the site's hydrology. This type of study, as well as further surveys for the rock skullcap, are warranted to understand what is happening to this globally rare plant at this site.
- Invasive plant species at this site should be controlled.

Location

Municipalities: Beaver County: *Center Township, Potter Township*
USGS quads: *Beaver*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Monaca Bluffs
Natural Heritage Area

Forested bluffs overlooking the Ohio River west of Monaca provide habitat for two species of concern, rock skullcap, a globally vulnerable plant, and the pipevine swallowtail.

Significance Rank:
REGIONAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Core Habitat***
- ***Other Supporting Landscape***
- ***Conservation Lands***

Newman Road Woods NHA

PNHP Significance Rank: *State*

Site Description

This forested valley has a rich hardwood forest dominated by sugar maple (*Acer saccharum*). Hemlock (*Tsuga canadensis*), American beech (*Fagus grandifolia*), and oaks (*Quercus* spp.) also grow here. The forest supports a **sensitive species of concern**, which cannot be named here at the request of the jurisdictional agency overseeing its protection.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	State	PA Legal Status[1]	Last Seen	Quality[2]
Sensitive species of concern A[3]	**S**	---	---	---	2013	BC

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Threats and Stresses

The site is bisected by Route 30. A new gas pipeline is going to bisect this site from the other direction, and could impact the species of concern. In the 1980s, parts of the Core Habitat were subdivided into small parcels for a planned residential development which has not yet been built.

Pete Woods, PNHP

A rich hardwood forest in early spring

Specific threats and stresses to the elements present at this site include the following:

- Several invasive exotic plants are present. Left to spread, these species will crowd out the species of concern and other native plants, as well as the species that rely on them. Garlic mustard (*Alliaria petiolata*) and Star-of-Bethlehem (*Ornithogalum umbellatum*) are abundant, and multiflora rose (*Rosa multiflora*) is growing within a meter of the species of concern. A large clone of periwinkle (*Vinca minor*) grows along the road, and could potentially spread into the forest.
- Conversion of forest to other land uses is a threat. Residential and industrial developments and the pipeline that is currently being built are in very close proximity to the species of concern.

Conservation Recommendations

The entire site is on privately-owned land.

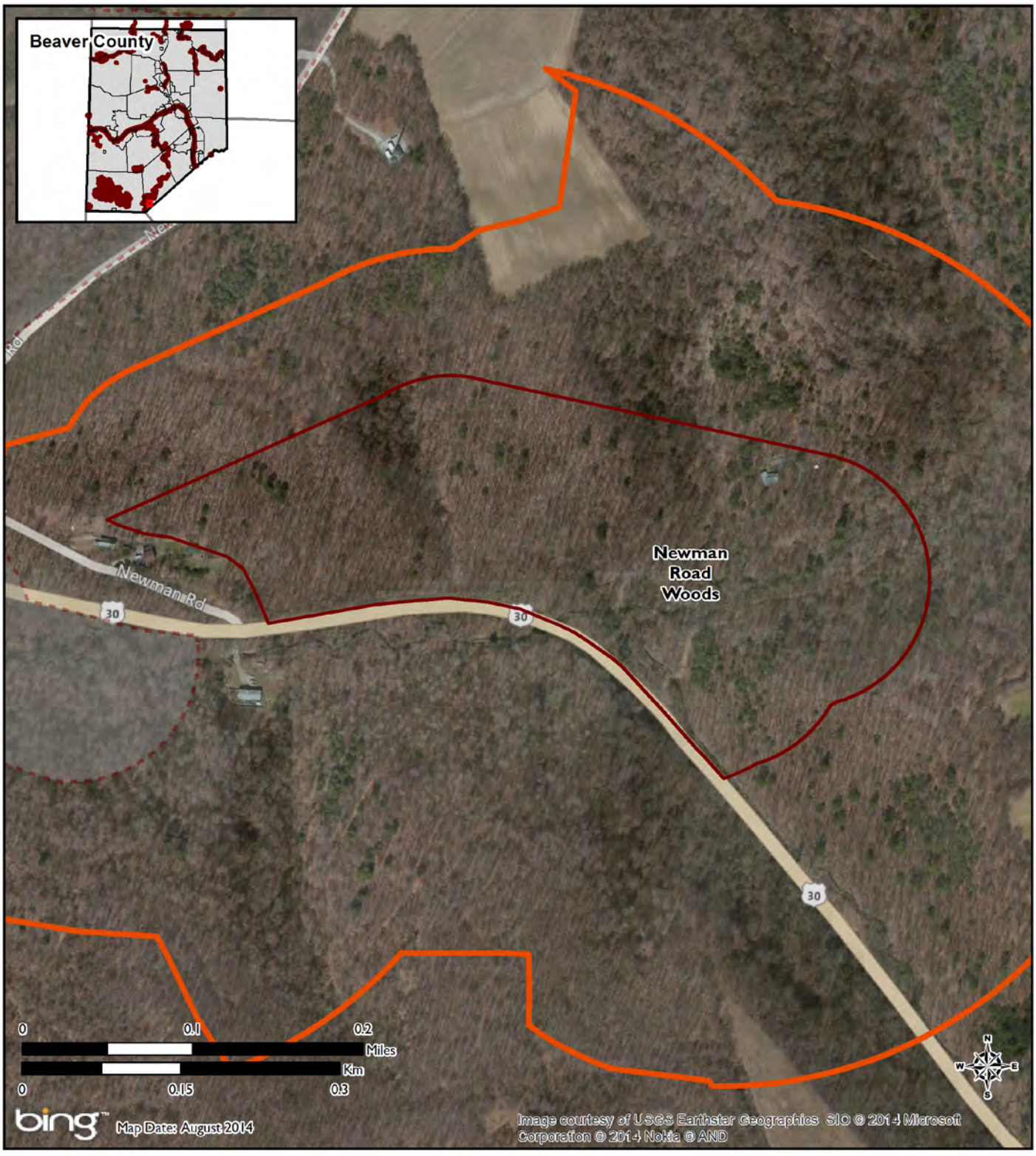
The following steps are recommended to ensure the persistence of these species at this site:

- Control invasive species of plants to prevent native species from being crowded out by introduced species. Sustained invasive species monitoring and control will be necessary.

- Protect the remaining habitat from conversion to housing, pipelines, and other land uses.

Location

Municipalities: *Beaver County: Independence Township*
USGS quads: *Clinton*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Newman Road Woods Natural Heritage Area

Forested habitat supports a sensitive species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Core Habitat***
- ***Other Supporting Landscape***

North Fork Kings Creek NHA

PNHP Significance Rank: *State*

Site Description

The North Fork of Kings Creek flows through this undisturbed forested valley, with a mesic hemlock – mixed hardwood forest on its lower slopes. At the downstream end of the site the stream slows, meandering across the floodplain, and forms a series of beaver ponds. The valley supports **two sensitive species of concern**, which cannot be named here at the request of the jurisdictional agencies overseeing their protection.

Pete Woods, PNHP

A sunny opening within the shaded hemlock forest in this valley

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Sensitive species of concern A[3]	S	---	---	---	7/8/2013	E
Sensitive species of concern A[3]	S	---	---	---	7/8/2013	E

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Threats and Stresses

One of the species of concern depends on clean groundwater, and is vulnerable to changes in the quality or quantity of the groundwater.

Specific threats and stresses to the elements present at this site include the following:

- The greatest threat to groundwater-dependent species is disruption to bedrock or any activity that alters groundwater flows or the quality of groundwater. Groundwater pollution can occur from septic systems, improperly lined underground waste disposal, and, in agricultural areas, from infiltration of pesticides, fertilizers, or nutrients from animal wastes.
- High densities of water wells can depress water tables, causing springs and seeps to become dry or shrink in size.

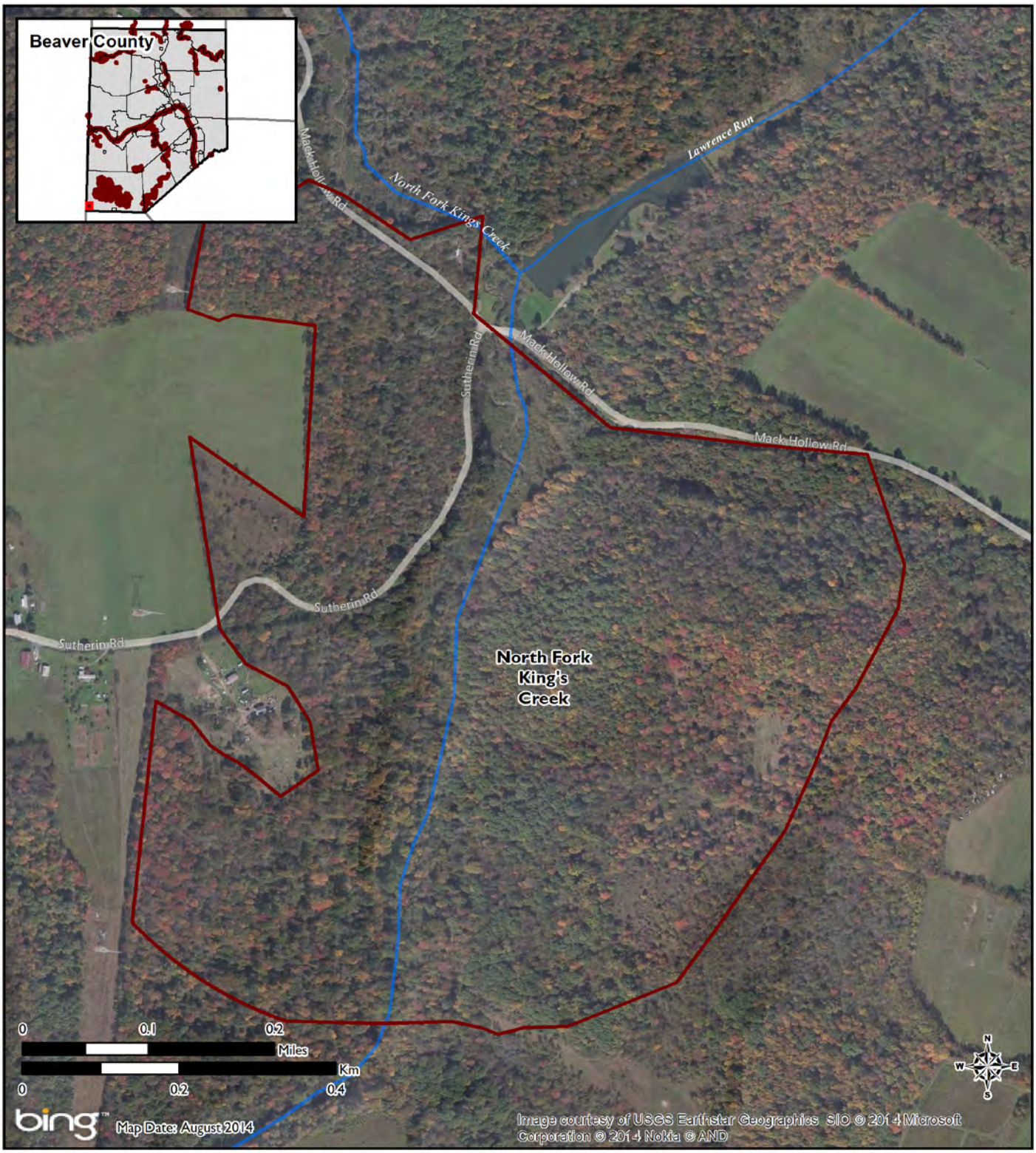
Conservation Recommendations

The following steps are recommended to ensure the persistence of these species at this site:

- Drilling, mining, or other disruptions to bedrock should not be undertaken within one-half mile of a seepage wetland without a thorough understanding of local bedrock geology, surficial geology, and groundwater flows. Groundwater flow patterns do not always mirror surface watersheds, and in some cases aquifers may be contiguous over large areas.
- Septic systems and water wells should be avoided or kept to low densities near the Core Habitat.

Location

Municipalities: *Beaver County: Hanover Township*
USGS quads: *Weirton*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



North Fork King's Creek Natural Heritage Area

This forested stream valley provides habitat for two species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas
- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Supporting Landscape***

North Fork Little Beaver Creek - State Line NHA

PNHP Significance Rank: *State*

Site Description

This small NHA is located in the northwest corner of Beaver County where North Fork Little Beaver Creek leaves Pennsylvania. The site is located on private property and is directly adjacent to State Game Lands #285 to the east. The floodplain forest at this site is dominated by sugar maple (*Acer saccharum*), elm (*Ulmus* spp.), hickory (*Carya* spp.), black cherry (*Prunus serotina*), and sycamore (*Platanus occidentalis*).

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name	PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Purple Rocket (*Iodanthus pinnatifidus*)	G5	S1	PE (PE)	6/14/1995	BC

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

Purple rocket blooms from late May through early June in good quality alluvial floodplain forests along rivers and low-lying areas. It is a tall attractive plant that produces a long cluster of purple to white stalked flowers. This plant prefers to grow in wet to moist conditions in rich, loamy soil with partial sun to medium shade from the forest canopy.

Threats and Stresses

Specific threats and stresses to the elements present at this site include the following:

- As the forest canopy matures; the heavy shade may not be conducive to the persistence of the purple rocket.
- Exotic invasive plants can grow densely and exclude native species. Garlic mustard (*Alliaria petiolata*) and dame's rocket (*Hesperis matronalis)* are common along floodplains and may start to exclude the purple rocket.
- Agricultural practices such as grazing livestock and tilling are potential sources of contamination and may lead to soil erosion.

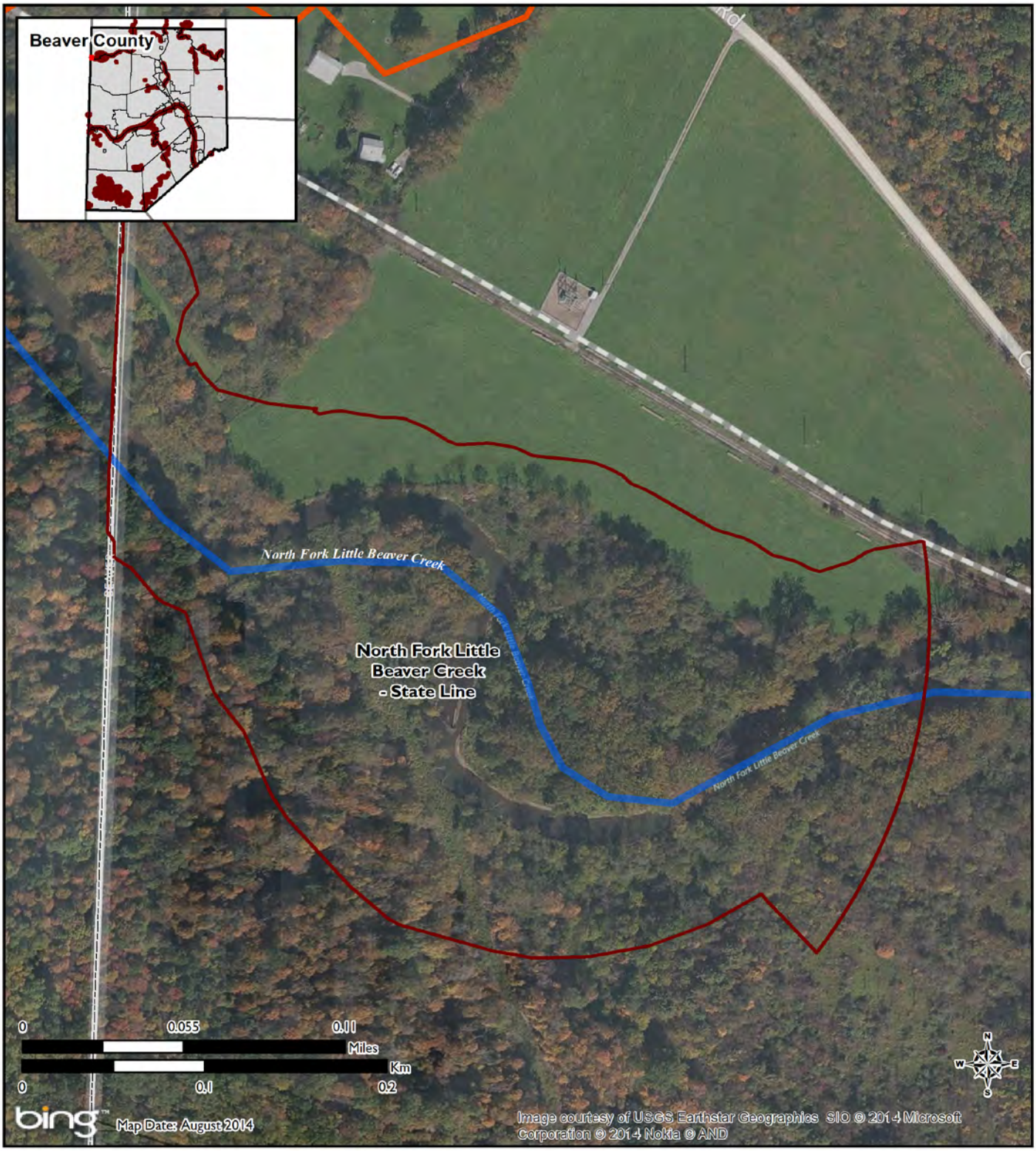
Conservation Recommendations

The following steps are recommended to ensure the persistence of these species at this site:

- Maintain growth with periodic artificial disturbance in the forms of flooding and canopy thinning.
- Invasive plant species at this site should be controlled. Removal by hand is effective if efforts are sustained.
- Preserve and expand the forested riparian buffer along the creek to help minimize runoff from roads, residences, and agriculture. Forested creek edges also slow the force of runoff allowing water to percolate into the groundwater.

Location

Municipalities: *Beaver County: Darlington Township, South Beaver Township*
USGS quads: *East Palestine*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



North Fork Little Beaver Creek - State Line Natural Heritage Area

This site supports a population of purple rocket, an endangered plant species in Pennsylvania.

Significance Rank:
STATE

Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- **Supporting Landscape**
- ***Other Supporting Landscape***
- ***Conservation Lands***

North Fork Little Beaver Creek at State Game Land #285 NHA

PNHP Significance Rank: *Regional*

Site Description

This site is centered on a section of the North Fork of Little Beaver Creek, and on the forest that grows on the adjacent floodplains and lower slopes. The forest on the south side of the creek, to the east of Watts Mills Road, is a particularly high quality forest. The floodplain and lower slopes contain a rich, mesic deciduous forest with abundant and diverse spring wildflowers, including large populations of uncommon species like blue-eyed Mary (*Collinsia verna*), dwarf larkspur (*Delphinium tricorne*), and sessile trillium (*Trillium sessile*, also known as toadshade). Vernal pools are located on the floodplain, providing seasonally flooded habitat that is critical to a variety of species.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Silvery Checkerspot (*Chlosyne nycteis*)		G5	S3S4	N (N)	5/24/2012	AC
West Virginia White (*Pieris virginiensis*)		G3?	S2S3	N (N)	5/1/2013	C
Gray Comma (*Polygonia progne*)		G4G5	S3	N (N)	5/4/2013	AC
Blue-tipped Dancer (*Argia tibialis*)		G5	S2	N (N)	5/24/2012	AC
Midland Clubtail (*Gomphus fraternus*)		G5	S2S3	N (N)	5/24/2012	AC
Rainbow Mussel (*Villosa iris*)		G5Q	S1	N (PE)	6/27/1987	BC
White Trout-lily (*Erythronium albidum*)		G5	S3	N (TU)	5/1/2013	BC

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Three butterfly species of concern are found here. The **West Virginia white** is a forest butterfly that depends on toothworts (*Cardamine* spp.) and other spring wildflowers. The **silvery checkerspot** is a mostly riparian species that uses wingstem (*Verbesina alternifolia*) as a host plant. The **gray comma** is a species of forests and edges that relies on elms (*Ulmus* spp.) and gooseberries (*Ribes* spp.) as host plants. **White trout-lily** is a rare spring flower found in rich floodplain habitats.

The creek provides habitat for a damselfly species of concern, the **blue-tipped dancer**, as well as a dragonfly species of concern, the **midland clubtail**. The creek also supports the **rainbow mussel**, though a living population was not observed in the most recent surveys. Two other mussel species of concern were once found here, along with several more common species, but very few live mussels are now present.

Pete Woods, PNHP

The North Country Trail passes through a dense stand of large-flowered trillium and other spring wildflowers.

Threats and Stresses

Eroding banks and a fairly silty stream bottom were observed in this creek. This stretch of the creek is not classified as Impaired by the DEP, but many of the creek's tributaries are considered Impaired for a variety of reasons, suggesting that conditions in the creek are not ideal.

Specific threats and stresses to the elements present at this site include the following:

- Sedimentation is a main cause of the freshwater mussel declines throughout North America, because it renders stream bottoms unsuitable as mussel habitat. Dragonflies and damselflies also rely on good water quality, although the tolerances of individual species to different types of pollution are not well-understood. Erosion, whether caused by deforestation, poor agricultural practices, or the destruction of riparian zones, leads to increased silt loads and shifting, unstable stream bottoms. Siltation and contaminants, such as heavy metals, pesticides, and abandoned mine drainage, have long been recognized as threats to mussels (Ortmann 1909; Williams *et al.* 1993). Increases in siltation can also indirectly impact freshwater mussel communities by interfering with host fish – mussel interactions. Increased sedimentation can reduce the abundance, diversity, and reproduction of fish, including the host fish that are necessary for protection and dispersal of virtually all freshwater mussels during their larval stage. The increased turbidity associated with suspended sediment loads also interferes with the visual cues used by both adult mussels and host fish in the transfer of the glochidia, or mussel larvae (Box and Mossa 1999).
- Fragmentation of the forest is a serious threat to the West Virginia white, because these butterflies do not cross wide roads or other non-forested areas. The result is that populations are becoming genetically isolated, and if a population is extirpated the chances are low that remaining populations will be able to recolonize the habitat.
- The use of pesticides in this forest while West Virginia whites are active would threaten them.
- High densities of white-tailed deer pose another threat to West Virginia whites, because deer browsing greatly reduces the abundance of many of the wildflowers that are crucial nectar sources for the butterflies. Although their flight period is short, adults rely on several successive waves of spring wildflowers to produce a steady supply of nectar. A reduction in abundance or diversity of spring wildflowers can leave these butterflies without a source of food.
- Exotic invasive plant species are present at this site, and if left to spread unchecked, they will crowd out native plants and the species that rely on them. The following species are present: dame's rocket (*Hesperis matronalis*), multiflora rose (*Rosa multiflora*), shrub honeysuckle (*Lonicera* spp.), and garlic mustard (*Alliaria petiolata*). Garlic mustard poses an especially great threat to the West Virginia white. This invasive plant is in the same family (the mustard family) as toothworts, and the chemical signatures of the plants are similar enough that female butterflies will readily lay their eggs on garlic mustard. The caterpillars, however, cannot survive on garlic mustard, and these butterflies have disappeared from areas where garlic mustard is dominant.

Pete Woods, PNHP

Two-leaved toothwort, a host plant for the West Virginia white butterfly

Conservation Recommendations

The following steps are recommended to ensure the persistence of these species at this site:

- Garlic mustard and other invasive species must be controlled in this area to avoid serious losses of biodiversity. Fragmentation of the remaining forest should be avoided. New development such as housing, roads, and powerlines should be concentrated in areas that have already been disturbed. White-tailed deer should be kept to a low density to avoid degradation of the forest's diversity.
- Avoid pesticide use, especially between early April and the end of June.
- Conserve and expand the forested riparian buffers of this creek system. Streams through forested areas should be considered high priority for conservation. The forested riparian corridor helps to regulate the temperature of the stream and creates streamside conditions that contribute to improved water quality and aquatic habitat. Streams through non-forested areas should be restored with native trees and shrubs appropriate to the habitat. Establish at least a 100 foot buffer of woody vegetation along the creek and its tributaries to help reduce erosion, sedimentation, and pollution. Additionally, best management practices (BMPs) that focus on limiting the introduction of non-point sources of pollution into surface and groundwater should be applied to the surrounding area

Location

Municipalities: *Beaver County: Darlington Township, South Beaver Township*
USGS quads: *East Palestine, New Galilee*
Previous CNHI reference: *Lower North Fork Little Beaver Creek*
Associated NHAs: *None*
Overlapping Protected Lands: *Lower North Fork Little Beaver Creek*

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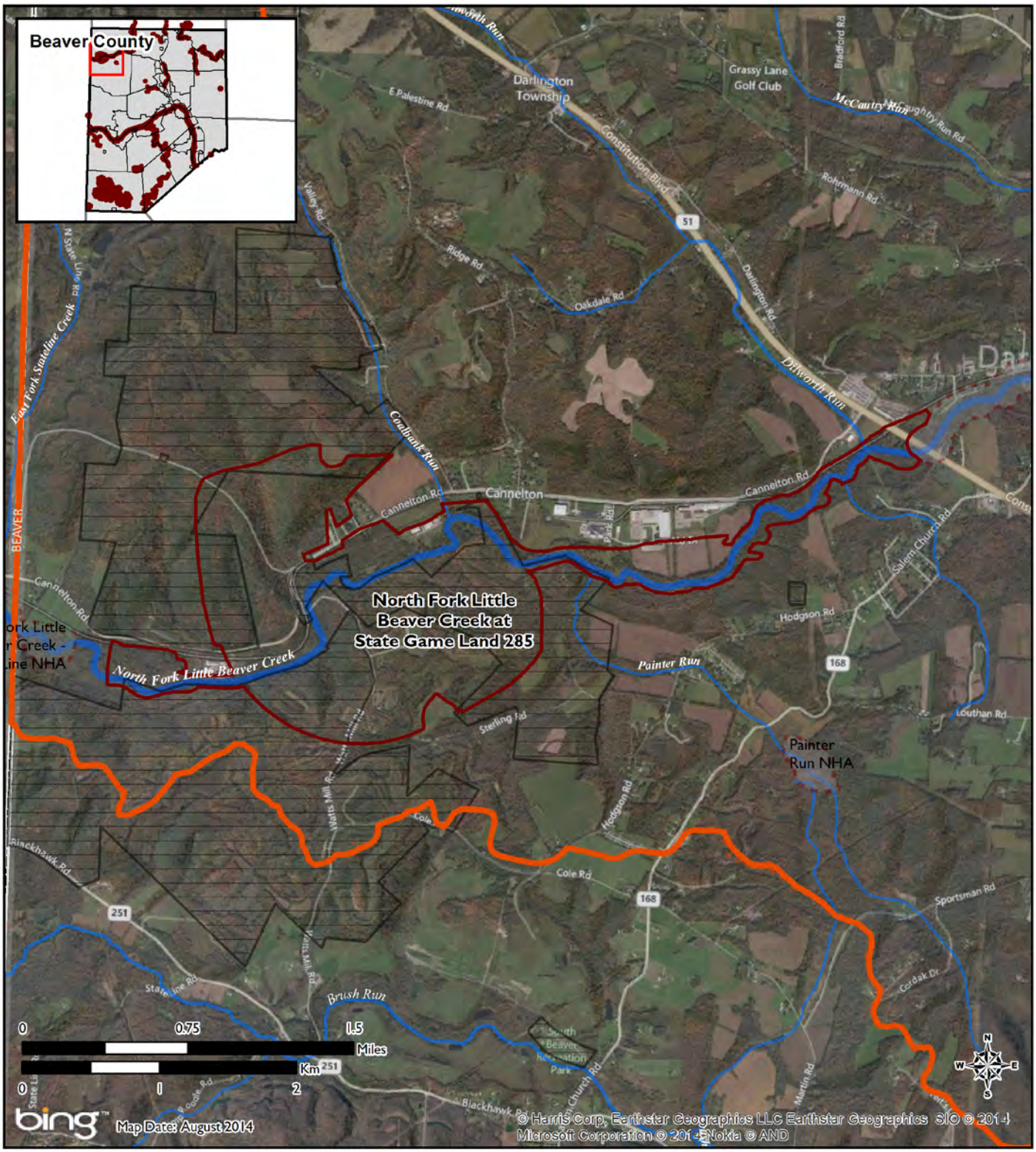


North Fork Little Beaver Creek at State Game Land 285 Natural Heritage Area

This site provides habitat for white trout-lily, a state rare plant, and a number of animal species of concern.

Significance Rank:
REGIONAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Core Habitat***
- ***Other Supporting Landscape***
- ***Conservation Lands***

Ohio River in Beaver County NHA

PNHP Significance Rank: *Global*

Site Description

This site represents a nearly 25-mile stretch of the Ohio River, its entire length in Beaver County. Starting at the Ohio and Pennsylvania state line the NHA Core Habitat contains the aquatic and near shore habitats of the Ohio River all the way to the Beaver and Allegheny County boundary south of Ambridge. The site supports a diversity of species of concern, including **three birds**, **six fishes**, **six mussels**, **one damselfly**, a **Silver Maple Floodplain Forest** community, and **five sensitive species of concern**. It is this great diversity of species of concern which contributes to the high ecological significance and conservation value of this site.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Peregrine Falcon (*Falco peregrinus*)		G4	S1B,S1N	PE (PE)	2007	E
Osprey (*Pandion haliaetus*)		G5	S3B	PT (PT)	5/3/2013	BC
Prothonotary Warbler (*Protonotaria citrea*)		G5	S2S3B	N (CR)	7/3/2009	CD
Skipjack Herring (*Alosa chrysochloris*)		G5	S4	N (DL)	1979	E
Smallmouth Buffalo (*Ictiobus bubalus*)		G5	S4	N (DL)	1985	E
Longnose Gar (*Lepisosteus osseus*)		G5	S4S5	N (DL)	8/13/1985	E
Silver Chub (*Macrhybopsis storeriana*)		G5	S3S4	N (DL)	8/17/1986	E
River Redhorse (*Moxostoma carinatum*)		G4	S3S4	N (DL)	7/24/1985	E
Channel Darter (*Percina copelandi*)		G4	S4	N (DL)	1983	E
Dusky Dancer (*Argia translata*)		G5	S3S4	N (N)	7/30/2013	AC
Flat Floater (*Anodonta suborbiculata*)		G5	S1	N (N)	9/24/2002	E
Fragile Papershell (*Leptodea fragilis*)		G5	S2	N (CR)	10/6/2005	E
Threehorn Wartyback (*Obliquaria reflexa*)		G5	SH	N (PX)	10/6/2005	E
Pink Heelsplitter (*Potamilus alatus*)		G5	S2	N (CR)	10/6/2005	E
Mapleleaf (*Quadrula quadrula*)		G5	S1S2	N (PT)	10/6/2005	E
Paper Pondshell (*Utterbackia imbecillis*)		G5	S3S4	N (CU)	10/6/2005	E
Silver Maple Floodplain Forest	C	GNR	S4	N (N)	9/18/1992	E
Sensitive species of concern A[3]	S	---	---	---	1983	E
Sensitive species of concern B[3]	S	---	---	---	9/9/1997	E
Sensitive species of concern C[3]	S	---	---	---	9/6/1984	E
Sensitive species of concern D[3]	S	---	---	---	10/6/2005	E
Sensitive species of concern E[3]	S	---	---	---	2/14/2014	E

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Peregrine falcons require a combination of large open areas for hunting and tall, inaccessible ledges as nesting and brood-rearing sites. The State Route 51 Bridge over the Ohio River at Monaca provides such habitat for peregrine falcons. The surrounding urban environment also provides ample prey resources in the form of feral rock pigeons (*Columa livia*) and other non-native bird species. Similarly, abundant fishes and nest platforms support multiple pairs of nesting **osprey** along the river. Bottomland forests of the Ohio River islands and its shores provide habitat for breeding **Prothonotary warblers**, one of just a couple of sites for this songbird in southwestern Pennsylvania.

David Yeany , PNHP

Ospreys nest at multiple locations along the Ohio River.

Aquatic habitats of the Ohio River support fish of the Large River Community and offer warm water temperatures, shallow shorelines, deep channels, and slack water impoundments behind dams (Walsh et al. 2007). Among the fish species of concern at this site are indicators of this community type, including the **smallmouth buffalo** and the **river redhorse.**

Currently, there are six species of state rare mussels which have populations within this NHA. Among these mussels is the **three-horn wartyback** which was thought to have been extirpated from Pennsylvania. However, in 2002 this species was re-discovered in the silt deposits around Phillis Island – seen for the first time in the state since before 1920. Historically, the mussel diversity in this section of the Ohio River was much richer with an additional 21 species of mussels once known from here. Many of these species were globally rare, but have now been extirpated from this part of the river, if not from the entire state, as a result of heavy industrial development, damming, and dredging.

Development impacts over the years have been felt by other taxa as well. Several rare plant species have been extirpated from this section of the Ohio River. **Blue false indigo** (*Baptisia australis*), last observed here in 1938, used to be found on scoured cobble bars in the river, but a suppressed flood regime has prevented this plant from persisting. The globally imperiled **Tennessee pondweed** (*Potamogeton tennesseensis*) was last seen in this area in 1952.

Threats and Stresses

Nearly all the elements of concern at this site are affected by the quality of hydrologic conditions of the Ohio River system. From prothonotary warblers needing flooded forests with cavity trees for nesting to mussels like the mapleleaf depending on aquatic microorganisms like phyto- and zooplankton for food to fish like the river redhorse requiring clean gravel and boulders substrates to support their invertebrate food sources and for nesting, the aquatic integrity of the Ohio River is essential to the persistence of these species. With the Ohio River in Beaver County traversing through so much urban development there are a number of threats related to these species' critical needs.

Threats to native mussels include the construction of dams, non-native invasive species such as the zebra mussel (*Dreissena polymorpha*) and the Asian clam (*Corbicula fluminea*), stream channelization, water

pollution, sedimentation from poor agriculture and forestry practices, bridge and road construction, and habitat loss through dredging (Richter et al. 1997).

Dredging removes sand and gravel substrate, and the deep depressions that remain often fill with silt and debris (Brown et al. 1998) unsuitable for colonization by riverine mussels. Altered substrate and flow resulting from gravel extraction can reduce or eliminate mussel populations (Hubbs et al. 2003). Dredging can alter river hydrology and increase silt in the water column. In addition to the direct effects to mussels, suspended sediments from excavation activities have led to the loss or reduction of fish and macroinvertebrate habitat (Brown et al. 1998, Cross et al. 1982).

Specific threats and stresses to the elements present at this site include the following:

Mike Good, iNaturalist

Three-horn wartyback was previously thought to be extirpated from the state but was rediscovered in the Ohio River in 2002.

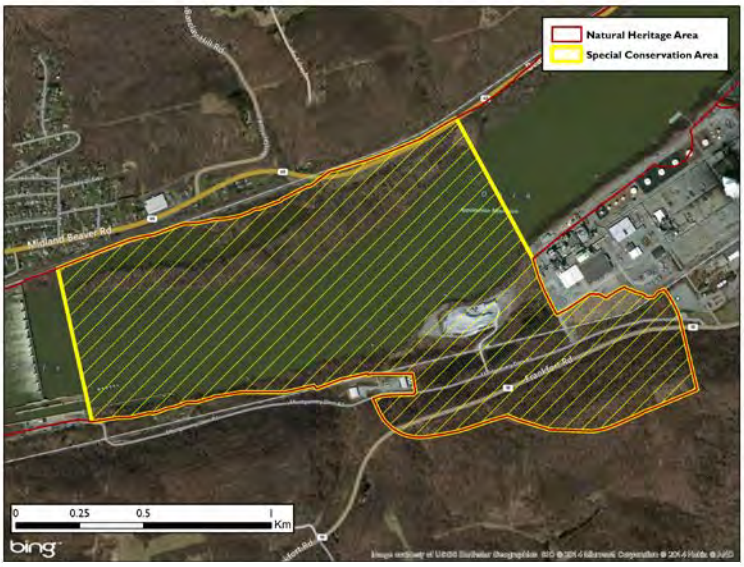
- Development of Ohio River islands, riparian forests, and near shore habitats could result in loss of forest habitat and degradation of aquatic habitat.
- Non-point source pollution contributes excess nutrients, sediments, and pesticide run-off which degrade aquatic systems.
- Agricultural and industrial pollution, impoundments, siltation, turbidity, and competition with non-native species threaten both fishes and mussels.
- Disturbance from routine bridge maintenance and other human activities within 300 meters of the peregrine falcon nest structure during the breeding season (late February through July) and osprey nest locations during March through July.
- Risk of raptor collision (especially for juveniles) with automobiles, buildings, power lines and towers, and other objects.
- Risk of avian mortality from pesticides or other chemical contaminants.

<u>Conservation Recommendations</u>

The following steps are recommended to ensure the persistence of these species at this site:

- Protect Ohio River habitats through acquisitions and easements of riparian buffer zones. Reduce siltation, chemical and sewage discharges, and monitor Core Habitat for potential sources of pollution and siltation. Maintain substrate characteristics, hydrologic connectivity, and maintain and/or improve existing flow regimes.
- Avoid or minimize in-stream disturbances and modifications such as sand and gravel dredging and construction of new dam impoundments.
- Control sediment runoff from mining, row crop agriculture, forestry, and degradation of riparian zones and aquatic habitat by livestock. Restore riparian vegetation and fence livestock from tributary streams in the Supporting Landscape and provide alternate water sources. Regulate land use in the Supporting Landscape and monitor construction, mining, and agricultural activities to minimize siltation and acid runoff.
- Maintain natural fish fauna by restricting stocking of non-native species and educate the public about the spread of non-native mussels through angler equipment.

- Maintain the Ohio River aquatic system to include fish spawning, rearing (juveniles), and dispersal (migration corridors) habitat.
- A Special Conservation Area was delineated just upstream of Montgomery Dam to highlight the importance of this area for nesting Prothonotary warblers, a colony of bank swallows, and an additional sensitive species of concern. Within this area, avoid fragmenting the existing riparian forests with additional buildings or infrastructure. Avoid removing trees, especially trees with cavities that could be used as nest trees by the Prothonotary warbler. Protect flooded bottomland forest and wetland that supports breeding Prothonotary warblers. This area is vulnerable to development and habitat alteration and should be targeted for land conservation.



A Special Conservation Area within the NHA was delineated above Montgomery Dam to highlight the vulnerability and significance of this sensitive habitat.

- Avoid disturbance from human activities within 300 meters of breeding sites within the Core Habitat during the breeding season for one of the sensitive species of concern (December – July).
- Schedule routine bridge maintenance and special activities within 300 meters of peregrine falcon nests outside critical nesting periods. Maintain nesting platforms as suitable nest structures for ospreys. Minimize human activities within 100 meters of osprey nesting platforms during the breeding season. Avoid the use of pesticides to control pigeons and other pest bird populations within 2 kilometers of the nest.

<u>Location</u>

Municipalities: *Beaver County: Aliquippa City, Ambridge Borough, Baden Borough, Beaver Borough, Bridgewater Borough, Center Township, Conway Borough, Crescent Township, East Rochester Borough, Economy Borough, Freedom Borough, Georgetown Borough, Glasgow Borough, Greene Township, Harmony Township, Hopewell Township, Industry Borough, Leetsdale Borough, Midland Borough, Monaca Borough, Ohioville Borough, Potter Township, Raccoon Township, Rochester Borough, Shippingport Borough, South Heights Borough, Vanport Township*
USGS quads: *East Liverpool North, Midland, Beaver, Baden, Hookstown, Ambridge*
Previous CNHI reference: *Ohio River, Ohioview Peninsula*
Associated NHAs: *None*
Overlapping Protected Lands: *Ohio River National Wildlife Refuge, Beaver County Parks*

<u>References and Additional Reading</u>

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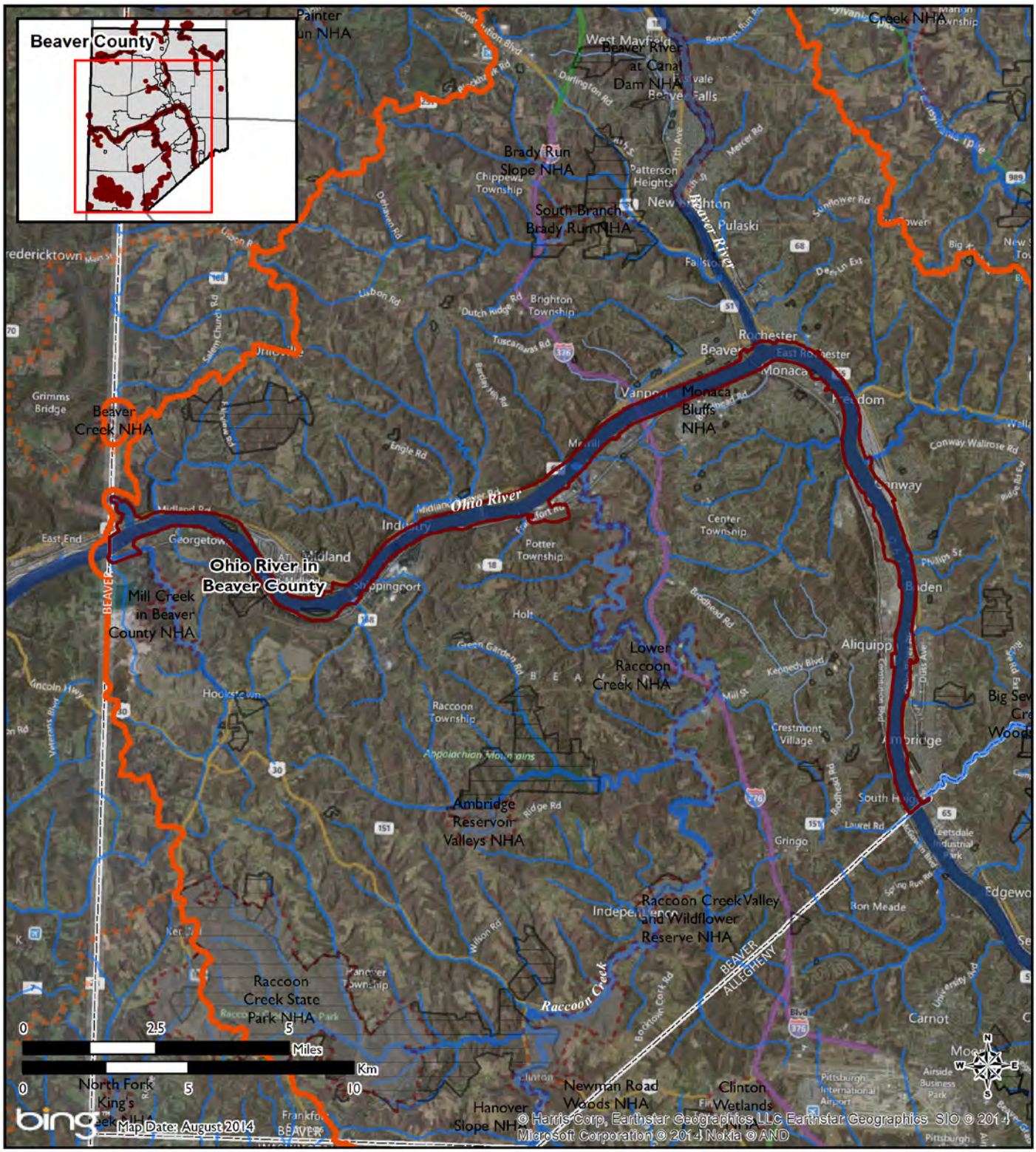


Ohio River in Beaver County Natural Heritage Area

This section of the Ohio River provides aquatic, riparian, and upland habitat for a high diversity of bird, fish, mussel and other invertebrate species of concern.

Significance Rank:
GLOBAL

Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Core Habitat***
- ***Other Supporting Landscape***
- ***Conservation Lands***

Painter Run NHA

PNHP Significance Rank: *State*

Site Description

This site is designated around a series of wetlands around Painter Run. The wetlands are a variety of types including active beaver ponds, beaver meadows dominated, extensive shrub wetlands, and deciduous swamp forests.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name	PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Grass-leaved Rush (*Juncus biflorus*)	G5	S2	TU (PT)	9/9/2013	C

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

At the northeast end of the site there is a small patch of prairie-like habitat that supports **grass-leaved rush**. The species has a wide distribution in North America from Ontario southward including most of the eastern half of the U.S. In Pennsylvania, most documented occurrences are in the southeastern portion of the state.

Threats and Stresses

Maintaining suitable aquatic habitat is the key to the continued success of the aquatic species of concern. Runoff from dirt and gravel roads in close proximity to waterways can contribute to physical degradation of their channels and erosion and sediment pollution in streams and rivers. Loss of forest cover within the core areas may also result in increased water temperatures and disruption of natural nutrient cycling linked to the river. If forest cover is substantially reduced within the watersheds, water quality is likely to decline from increased sediment loads. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events.

Specific threats and stresses to the elements present at this site include the following:

- Conversion to other land uses by draining or filling of the wetland may be a threat to the persistence of the species at this site.
- Invasive species of plants may impact the rare species present at this site.

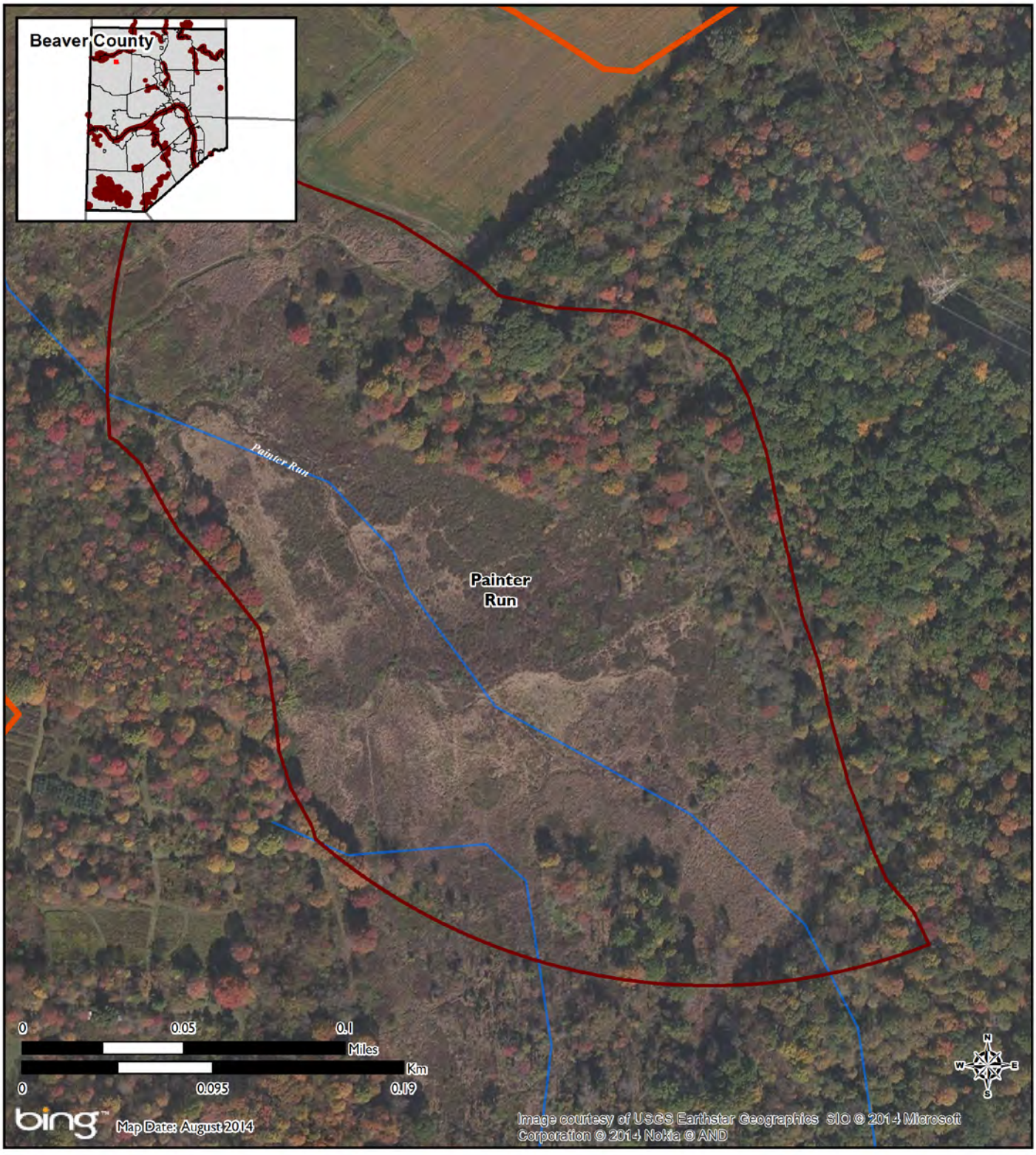
Conservation Recommendations

The following steps are recommended to ensure the persistence of these species at this site:

- Conserve the forested riparian buffers of all streams and wetlands. Conserve at least a 100 meter (328 foot) buffer of native woody vegetation where it exists along the waterways and wetlands and establish at least a 30 meter (100 foot) buffer where it is lacking to help reduce erosion, sedimentation, and pollution. Additionally, best management practices (BMPs) that focus on limiting the introduction of non-point sources of pollution into surface and groundwater should be applied to the surrounding area.
- Control invasive species of plants to prevent native species from being crowded out by introduced species. Continuing invasive species monitoring and control will be necessary.

Location

Municipalities: *Beaver County: South Beaver Township*
USGS quads: New Galilee
Previous CNHI reference: *Painter Run Wetlands*
Associated NHAs: *None*
Overlapping Protected Lands: *Painter Run Wetlands*



Painter Run
Natural Heritage Area

Wetland habitat along Painter Run supports a population of grass-leaved rush, a plant species of concern in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas
- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Supporting Landscape***

Raccoon Creek State Park NHA

PNHP Significance Rank: *Regional*

Site Description

This NHA is located in southwestern Beaver County and encompasses a large portion of Raccoon Creek State Park. The site is bisected by Traverse Creek, and its many tributaries, with red oak-mixed hardwoods as the dominant forest type. However, a number of other habitats are found here including northern hardwoods forest, dry-oak heath forest, conifer plantations, riparian wetlands, and old field, meadow, and other early successional habitats.

David Yeany, PNHP

Leonard's Skipper nectaring on Joe-Pye-weed (*Eutrochium* sp.)

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Falcate Orangetip (*Anthocharis midea*)		G4G5	S3	N (N)	4/29/2010	AC
Harvester (*Feniseca tarquinius*)		G4	S3	N (N)	7/2006	AC
Leonard's Skipper (*Hesperia leonardus*)		G4	S3	N (N)	8/22/2007	AC
Gray Comma (*Polygonia progne*)		G4G5	S3	N (N)	8/2011	E
Coral Hairstreak (*Satyrium titus*)		G4G5	S3	N (N)	6/27/2010	AC
Regal Moth (*Citheronia regalis*)		G4G5	SU	N (N)	9/12/2004	E
Featherbells (*Stenanthium gramineum*)		G4G5	S3	N (PR)	7/30/2013	BC
Sensitive species of concern A[3]	S	---	---	---	7/26/2013	E
Sensitive species of concern B[3]	S	---	---	---	6/25/2013	BC
Sensitive species of concern C[3]	S	---	---	---	10/6/2009	E
Sensitive species of concern D[3]	S	---	---	---	7/1/2013	E
Sensitive species of concern E[3]	S	---	---	---	4/18/2013	BC

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

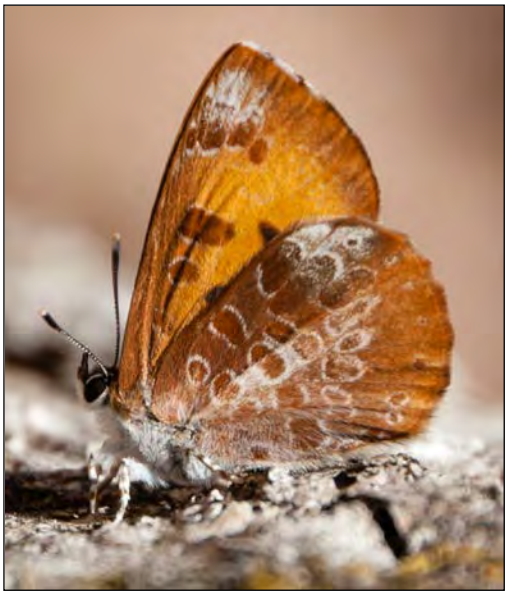
[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Various forested, aquatic, and riparian habitats support four **sensitive species of concern** that cannot be named at the request of the jurisdictional agency overseeing their protection.

Falcate orangetip is a butterfly species found in a variety of habitats including open canopy riparian forests and swamps. It utilizes several different host plants in the mustard family (Brassicaceae). Found along the East Coast south from Massachusetts through Georgia, its range in Pennsylvania is primarily south of Interstate 80 and absent or uncommon in mountainous areas.

The **Harvester** is a butterfly found throughout Pennsylvania. It is our only predatory butterfly species and requires wooly aphids (Homoptera), typically found on alders (*Alnus* spp.), as its only food source during its larval stage. Adults typically do not nectar on flowers either, but rather depend on the sweet "honeydew" produced by the aphids, sap, fecal material, or carrion. Given its specialized food requirements, the harvester is most often found in riparian forests and alder swamps where it can find its aphid host.



Cyric, iNaturalist

Harvester

Leonard's skipper emerges in late August and September and is fairly widespread across Pennsylvania. It occupies a variety of graminoid and early successional habitats but is likely declining. It specializes in the use of little bluestem (*Schizachyrium scoparium*) as its larval hostplant along with several other grasses. Most often it nectars on tall, pink or purple flowers, like the Joe-Pye-weed (*Eutrochium* sp.) shown above.

Gray comma is a butterfly typically associated with northern, boreal-type, forests, but it is widely distributed across Pennsylvania. This species depends on gooseberries (*Ribes* spp.) and azaleas (*Rhododendron* spp.) as its host plants. It often inhabits rich, northern hardwoods or mixed forests. Like the harvester, the adult gray comma rarely feeds on flower nectar, rather it gets sustenance from tree sap and decayed plant material.

Coral hairstreak is found across the state in various early successional habitats – old fields, forest clearings, and second growth stands. It uses a number of different species from the rose family (Rosaceae) as larval host plants. Butterfly milkweed (*Asclepias tuberosa*) is its preferred nectar source.

Threats and Stresses

Some sensitive species of concern at this site depend on clean groundwater, and are vulnerable to changes in the quality or quantity of this water source. Other species of concern rely on high quality surface water and healthy aquatic and wetland systems. Many of the butterfly species of concern need specific host plants during their larval stage and flower nectar sources during their adult stage.

Specific threats and stresses to the elements present at this site include the following:

- Forest fragmentation due to development or infrastructure activities could result in habitat loss and degradation of the site.
- Natural succession of open habitats, such as Nichol Field and other areas, threaten to reduce available food sources for butterfly species without proper management.
- Introduction of non-native species can create competition for resources and alter the population dynamics of native food sources.
- Over-browsing by white-tailed deer is a serious threat to the overall understory plant diversity. An overabundance of deer can create the effect of open woodlands in which the native plant understory and vertical stratification are greatly reduced. A reduction in abundance or diversity of wildflowers can leave these butterflies without a source of food.

- Storm water runoff from surrounding infrastructure including roadways and residential developments can potentially increase the amount of pollutants entering the creek.
- The greatest threat to groundwater-dependent species is disruption to bedrock or any activity that alters groundwater flows or the quality of groundwater. Groundwater pollution can occur from septic systems, improperly lined underground waste disposal, and, in agricultural areas, from infiltration of pesticides, fertilizers, or nutrients from animal wastes.

Conservation Recommendations

Streams flowing through forested areas should be considered high priority for conservation of the habitat. The forested riparian corridor helps to regulate the temperature of the stream and creates streamside conditions that contribute to improved water quality and aquatic habitat. Successional forest along Nichol Road and the meadow-like conditions of Nichol Field, embedded within a diverse forest matrix, provide a substantial source of nectaring habitat for butterfly species of concern.

The following steps are recommended to ensure the persistence of these species at this site:

- Maintain Nichol Field, clearings, and other old field areas in an early successional state that supports both host plants and nectar (pollinator) plants for butterflies. Mowing, fire, herbicide, and grazing are all possible management methods that could be considered. Timing and scale will need to be considered with each of these treatments to avoid key periods in butterfly life cycles. Develop a pollinator conservation plan utilizing Natural Areas and Rangelands habitat management guidelines created by the Xerces Society for Invertebrate Conservation (see references).
- Insecticide use within the Core Habitat should be done very judiciously. Timing of insecticide treatments should occur outside sensitive periods during the life cycles of the butterfly species of concern. Spraying of host plants and nectar sources (especially when in bloom) should be avoided.
- Avoid fragmenting the existing forested areas with additional buildings or infrastructure. The primary conservation concern for this habitat should be to focus on safeguarding the quality and expanse of the forested landscape.
- Protect existing riparian zones and repair those that have been degraded with native trees and shrubs appropriate to the habitat.
- Maintain existing native populations of primary food sources and host plants, and avoid introducing non-native competitors.
- Control invasive species of plants to prevent native species from being crowded out by introduced species. Invasive species removal efforts should focus on reducing the prevalence of woody species such as Norway maple, Japanese barberry, common privet, bush honeysuckles, Japanese honeysuckle, multiflora rose, autumn olive, and winged euonymus. Target pioneer populations of invasive plants for immediate and continued removal. It is much easier and more effective to keep a place invasive-free than to try to repair a heavily infested habitat. Invasive species management should be coordinated by individuals familiar with the native species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Drilling, mining, or other disruptions to bedrock should not be undertaken within one-half mile of a seepage wetland without a thorough understanding of local bedrock geology, surficial geology, and groundwater flows. Groundwater flow patterns do not always mirror surface watersheds, and in some cases aquifers may be contiguous over large areas.
- Septic systems and water wells should be avoided or kept to low densities near the Core Habitat.

- Additional surveys for Lepidoptera (butterflies and moths) and Odonata (dragonflies and damselflies) are warranted at this site throughout suitable habitats in Raccoon Creek State Park. Additional research to determine locations of host plants important to butterflies at this site would aid habitat management.

Location

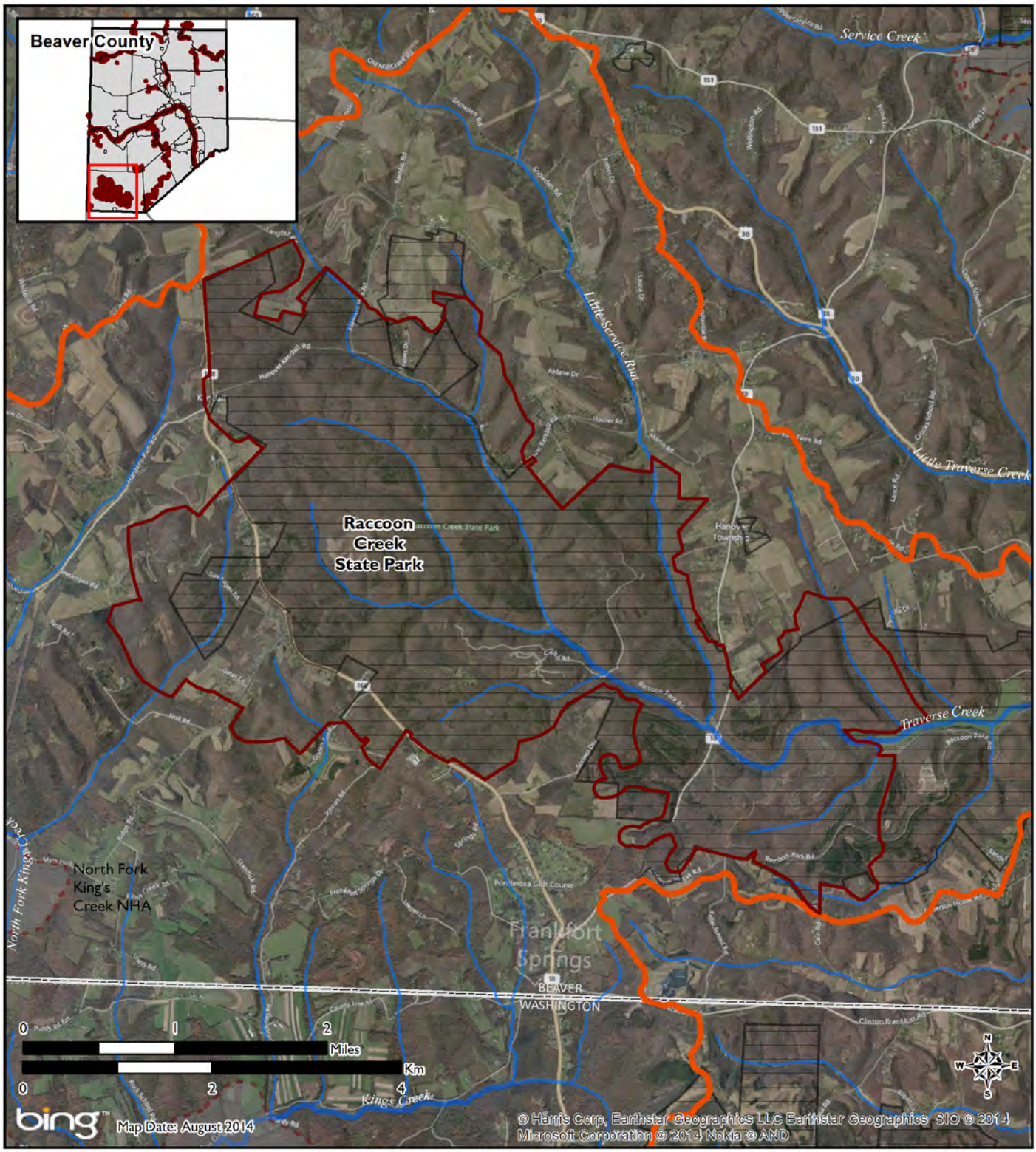
Municipalities: *Beaver County: Hanover Township*
USGS quads: *Hookstown, Burgettstown*
Previous CNHI reference: *Valley Picnic Area*
Associated NHAs: *None*
Overlapping Protected Lands: *Valley Picnic Area*

References and Additional Reading

Cech, R. and G. Tudor. 2005. Butterflies of the East Coast: an observer's guide. Princeton University Press. Princeton, New Jersey. 345 pp.

Opler, Paul A., Kelly Lotts, and Thomas Naberhaus, coordinators. 2012. Butterflies and Moths of North America. Data set accessed 2014-8-12 at http://www.butterfliesandmoths.org/.

Hoffman Black, S., N. Hodges, M. Vaughan, and M. Shepherd. 2008. Pollinators in natural areas: a primer on habitat management. Xerces Society for Invertebrate Conservation. Available online at: http://www.xerces.org/wp-content/uploads/2008/11/pollinators_in_natural_areas_xerces_society.pdf



Raccoon Creek State Park Natural Heritage Area

Diverse habitats support a number of animal species of concern, including several rare butterflies, as well as the state rare plant, featherbells.

Significance Rank:
REGIONAL

Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- *Core Habitat*
- *Supporting Landscape*
- *Other Core Habitat*
- *Other Supporting Landscape*
- *Conservation Lands*

Raccoon Creek Valley and Wildflower Reserve NHA

PNHP Significance Rank: *Regional*

Site Description

This site includes the Wildflower Reserve of Raccoon Creek State Park, as well as additional land along the Raccoon Creek valley. The 314-acre Raccoon Creek Wildflower Reserve contains one of the most diverse stands of wildflowers in western Pennsylvania. Over 700 species of plants have been identified in the Reserve (Miller 2006). Trails lead through a variety of habitats like oak-hickory forest, pine plantations, woodland meadows, and flood plain forest along Raccoon Creek.

Cliffs up to 30 feet high are composed of shale – one of the calcareous shale layers adjacent to the Ames limestone, which has a strong influence on the plants on the cliff and on the floodplain below. Piles and slopes of shale talus have accumulated at the base of the cliff, and these grade into a flat floodplain on the east bank of Raccoon Creek.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Pied-billed Grebe (*Podilymbus podiceps*)		G5	S3B,S4N	N (CR)	6/6/2005	E
Silvery Checkerspot (*Chlosyne nycteis*)		G5	S3S4	N (N)	8/9/2010	AC
West Virginia White (*Pieris virginiensis*)		G3?	S2S3	N (N)	3/22/2006	B
Blue-tipped Dancer (*Argia tibialis*)		G5	S2	N (N)	7/26/2013	AC
Dusky Dancer (*Argia translata*)		G5	S3S4	N (N)	7/26/2013	AC
Rapids Clubtail (*Gomphus quadricolor*)		G3G4	S1S2	N (N)	6/4/2013	AC
Puttyroot (*Aplectrum hyemale*)		G5	S3	PR (PR)	5/12/1992	F
Vase-vine Leather-flower (*Clematis viorna*)		G5	S1	PE (PE)	7/27/2012	C
Harbinger-of-spring (*Erigenia bulbosa*)		G5	S4	PT (PR)	4/13/2012	B
White Trout-lily (*Erythronium albidum*)		G5	S3	N (TU)	4/26/2013	AC
Purple Rocket (*Iodanthus pinnatifidus*)		G5	S1	PE (PE)	6/18/2013	C
Yellow Water-crowfoot (Ran*unculus flabellaris*)		G5	S2	N (PT)	5/20/2013	B
Meadow Rose (*Rosa blanda*)		G5	SU	N (TU)	5/31/1952	H
Sensitive species of concern A[3]	**S**	---	---	---	4/5/2013	E
Sensitive species of concern B[3]	**S**	---	---	---	7/5/2012	E
Sensitive species of concern C[3]	**S**	---	---	---	4/12/2012	BC
Sensitive species of concern C[3]	**S**	---	---	---	5/21/2013	AB

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Pied billed grebes have been known to breed at Independence Marsh. The **West Virginia white** is a globally vulnerable forest butterfly known from the Wildflower Reserve, and has also been seen at the Independence Township Park. Additional fieldwork is needed at the township park to determine what areas are being used by the butterfly. **Silvery checkerspots** are known from around Independence Marsh and are likely to be found elsewhere in this NHA. This stretch of Raccoon Creek supports

several dragonfly and damselfly species of concern, including the globally vulnerable **rapids clubtail**.

A small population of **puttyroot** is known from the Wildflower Reserve, but it has not been seen in recent years and this population may have failed. **Yellow water-crowfoot** is an aquatic buttercup that grows in a vernal pool in the Wildflower Reserve. **White trout-lily** grows on the floodplains of the Wildflower Reserve and other parts of this NHA, and **vase-vine leather-flower** is also known from the reserve. **Purple rocket** is known from two places in this NHA, but it has declined from previous years, for unknown reasons. **Meadow rose** was historically known from this area, but it has not been seen for a number of decades.

Other uncommon plants known from the Wildflower Reserve include **harbinger-of-spring** (*Erigenia bulbosa*), burr oak (*Quercus macrocarpon*), leafcup (*Polymnia canadensis*), and beak grass (*Diarrhena obovata*).

Threats and Stresses

Aquatic life was declining in Raccoon Creek by 1908 (Ortmann 1909), and in 1924 coal mine drainage killed what aquatic life remained (Henrici, 1951). In recent years many of the worst discharges have been remedied through the installation of treatment systems. Freshwater mussels were once present in the creek, but no live mussels have been found in many decades. Conditions might now be appropriate for mussels to return, but it will take time for them to recolonize the creek from the Ohio River.

Specific threats and stresses to the elements present at this site include the following:

- Fragmentation of the forest is a serious threat to the West Virginia white, because these butterflies do not cross wide roads or other non-forested areas. The result is that populations are becoming genetically isolated, and if a population is extirpated the chances are low that remaining populations will be able to recolonize the habitat.
- An even greater threat to the West Virginia white is the spread of garlic mustard (*Alliaria petiolata*). This invasive plant is in the same family as toothworts (the mustard family), and the chemical signatures of the plants are similar enough that female butterflies will readily lay their eggs on garlic mustard. The caterpillars, however, cannot survive on garlic mustard, and these butterflies have disappeared from areas where garlic mustard is dominant. At this site garlic mustard is present at low densities, but widely distributed across the site.
- High densities of white-tailed deer pose another threat to West Virginia whites, because deer browsing greatly reduces the abundance of many of the wildflowers that are crucial nectar sources for the butterflies. Although their flight period is short, adults rely on several successive waves of spring wildflowers to produce a steady supply of nectar. A reduction in abundance or diversity of spring wildflowers can leave these butterflies without a source of food.
- Exotic invasive plant species threaten to compete with and displace native species. Numerous invasive species are present in this part of the Raccoon Creek valley. Among the most abundant are Japanese knotweed (*Polygonum cuspidatum*), garlic mustard (*Alliaria petiolata*), dame's rocket (*Hesperis matronalis*), multiflora rose (*Rosa multiflora*), Morrow's honeysuckle (*Lonicera morrowii*), Japanese stilt grass (*Microstegium vimineum*), and barberry (*Berberis thunbergii*).
  Other invasive species that have been documented in the Wildflower Reserve include poverty brome (*Bromus sterilis*), Oriental bittersweet (*Celastrus orbiculatus*), porcelainberry (*Ampelopsis brevipedunculata*), tree-of-heaven (*Ailanthus altissima*), autumn olive (*Elaeagnus umbellata*), day lily (*Hemerocallis fulva*), pale yellow iris (*Iris pseudacorus*), and vinca (*Vinca minor*).

Conservation Recommendations

The area that became the Wildflower Reserve was purchased 1962 by the Western Pennnsylvania Conservancy, and became part of the state park in 1971.

The following steps are recommended to ensure the persistence of these species at this site:

- Garlic mustard and other invasive species must be controlled in this area to avoid serious losses of biodiversity. Fragmentation of the remaining forest should be avoided. New development such as housing, roads, and powerlines should be concentrated in areas that have already been disturbed. White-tailed deer should be kept to a low density to avoid degradation of the forest's diversity.
- Additional surveys for West Virginia white are warranted in other valleys around the reservoir. Additional research to conclusively determine which host plants are used by West Virginia whites at this site would help settle the question of whether cut-leaved toothwort can be the sole host plant for a population of these butterflies.
- Control invasive species of plants to prevent native species from being crowded out by introduced species. Continuing invasive species monitoring and control will be necessary.

Location

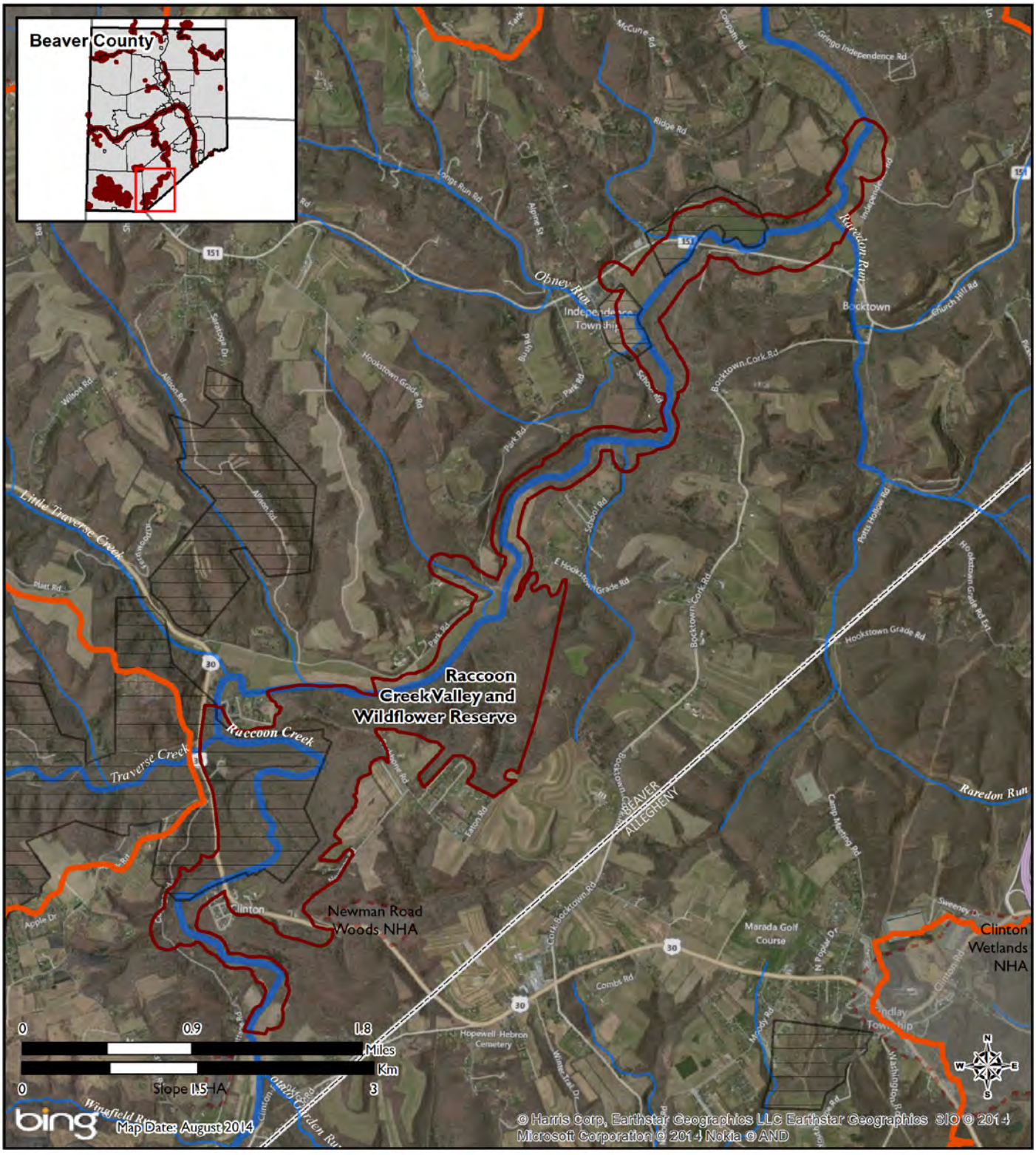
Municipalities: Beaver County: Hanover Township, Independence Township
USGS quads: Aliquippa, *Clinton*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*

References and Additional Reading

Henrici, M. 1951. Raccoon Creek and its Flora. Trillia: Proceedings of the Botanical Society of Western Pennsylvania. Vol 11. May be accessed at: http://www.botsocwpa.org/resources/BSWP%20Mr-Apr-2011.pdf

Miller, Shane. (2006). Past and Present: Vascular Plants of the Wildflower Reserve at Raccoon Creek State Park. Pennsylvania Department of Conservation and Natural Resources. Harrisburg, PA.

Ortmann, A.E. 1909. The destruction of freshwater fauna in western Pennsylvania. Proceedings of the American Philosophical Society 48:90-110.



Raccoon Creek Valley and Wildflower Reserve Natural Heritage Area

Rich forests, floodplains, and aquatic habitats within the Raccoon Creek State Park Wildflower Reserve and along Raccoon Creek support many species of concern.

Significance Rank:
REGIONAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Core Habitat***
- ***Other Supporting Landscape***
- ***Conservation Lands***

South Branch Brady Run NHA

PNHP Significance Rank: *State*

Site Description

This stretch of the South Branch of Brady Run, along with the adjacent uplands, supports a **sensitive species of concern**, which cannot be named here at the request of the jurisdictional agency overseeing its protection. The tributary valley to the northwest contains a large population of **heartleaf meehania**. This may be the only native population of this species on public land in Pennsylvania, and this is a good site for wildflower enthusiasts to see the species in the wild.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Heartleaf Meehania (*Meehania cordata*)		G5	S1	TU (PE)	5/9/2012	AB
Sensitive species of concern A[3]	**S**	---	---	---	5/9/2012	E
Sensitive species of concern B[3]	**S**	---	---	---	7/3/2012	E

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Threats and Stresses

Maintaining suitable aquatic habitat is the key to the continued success of the aquatic species of concern. Runoff from dirt and gravel roads in close proximity to waterways can contribute to physical degradation of their channels and erosion and sediment pollution in streams and rivers. Loss of forest cover within the core areas may also result in increased water temperatures and disruption of natural nutrient cycling linked to the river. If forest cover is substantially reduced within the watersheds, water quality is likely to decline from increased sediment loads. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events.

Pete Woods, PNHP

Heartleaf meehania with flower buds.

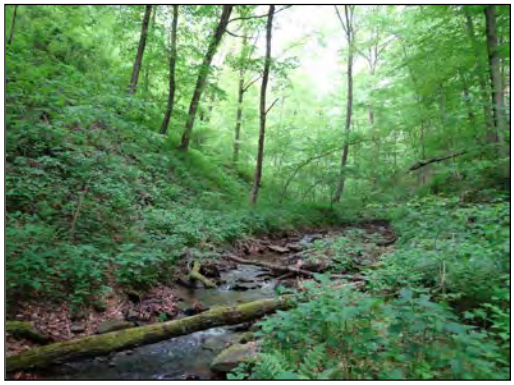
Specific threats and stresses to the elements present at this site include the following:

- The species of concern relies on good water quality. Erosion, whether caused by deforestation, poor agricultural practices, or the destruction of riparian zones, leads to increased silt loads and shifting, unstable stream bottoms. Siltation and contaminants such as heavy metals, pesticides, and abandoned mine drainage are potential threats to these species.

- Garlic mustard (*Alliaria petiolata*) is intermixed with the heartleaf meehania in the lower part of the valley, and multiflora rose (*Rosa multiflora*) is also present.

Conservation Recommendations

The following steps are recommended to ensure the persistence of these species at this site:



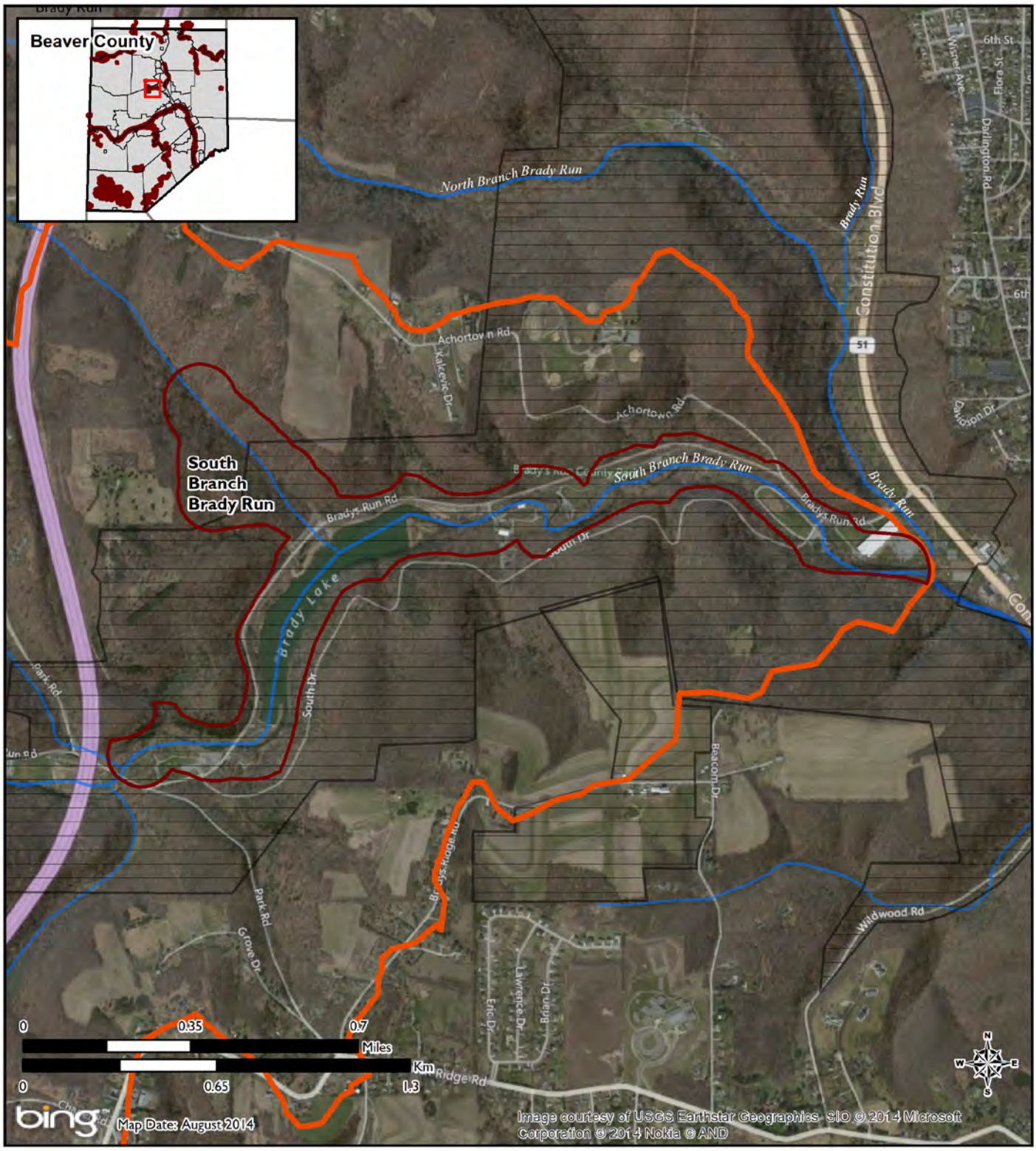
Pete Woods, PNHP

The forested valley that supports heartleaf meehania.

- Conserve the forested riparian buffers of all streams and wetlands. Conserve at least a 100 meter (328 feet) buffer of native woody vegetation where it exists along the waterways and establish at least a 30m (100 foot) buffer where it is lacking to help reduce erosion, sedimentation, and pollution. Additionally, best management practices (BMPs) that focus on limiting the introduction of non-point sources of pollution into surface and groundwater should be applied to the surrounding area. The forested buffers at this site are minimal in some places, and could be improved.
- Invasive plant species at this site should be controlled. Removal of garlic mustard and multiflora rose is effective if efforts are sustained.

Location

Municipalities: *Beaver County: Brighton Township, Chippewa Township*
USGS quads: *Beaver*
Previous CNHI reference: *North Branch Valley, South Branch Valley*
Associated NHAs: *None*
Overlapping Protected Lands: *North Branch Valley, South Branch Valley*



South Branch Brady Run Natural Heritage Area

This site supports two sensitive species of concern and the state rare plant, heartleaf meehania.

Significance Rank:
STATE

PNHP
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Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Core Habitat***
- ***Other Supporting Landscape***
- ***Conservation Lands***

Stockman Run NHA

PNHP Significance Rank: *State*

Site Description

As a tributary of the Beaver River in the north central part of the county, Stockman Run is a popular warm water fishery. The upper reaches of this stream are flanked by steep forested slopes while the middle portions of the creek open up in a floodplain before meandering through the borough of Koppel and emptying into the Beaver River. The numerous habitats throughout the Stockman Run NHA support a great diversity of plants and animals, including a **sensitive species of concern**.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	State	PA Legal Status[1]	Last Seen	Quality[2]
Sensitive species of concern A[3]	**S**	---	---	---	4/29/2003	E

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.

[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Threats and Stresses

Agriculture, mining, and rural development represent the most significant threats and stresses to the Stockman Run NHA. Species within this NHA are vulnerable to physical and chemical changes to the aquatic, as well as terrestrial environments.

Specific threats and stresses to the elements present at this site include the following:

- Excess loose particles and sedimentation can change the water composition of sites.
- Habitats sensitive to groundwater and/or surface flow may be affected by changes in the landscape caused by mining.
- Habitats sensitive to groundwater and/or surface flow may be affected by changes in landscape caused by ditching fields.
- Runoff waters from agricultural fields may contain pesticides and herbicides harmful to native plant and animal species.
- Chloride-based salts (sodium chloride, magnesium chloride, potassium chloride, etc.) can have detrimental impacts on vegetation, soil composition, and aquatic life.
- Roads in particular create obstacles for species that are migrating between habitats.

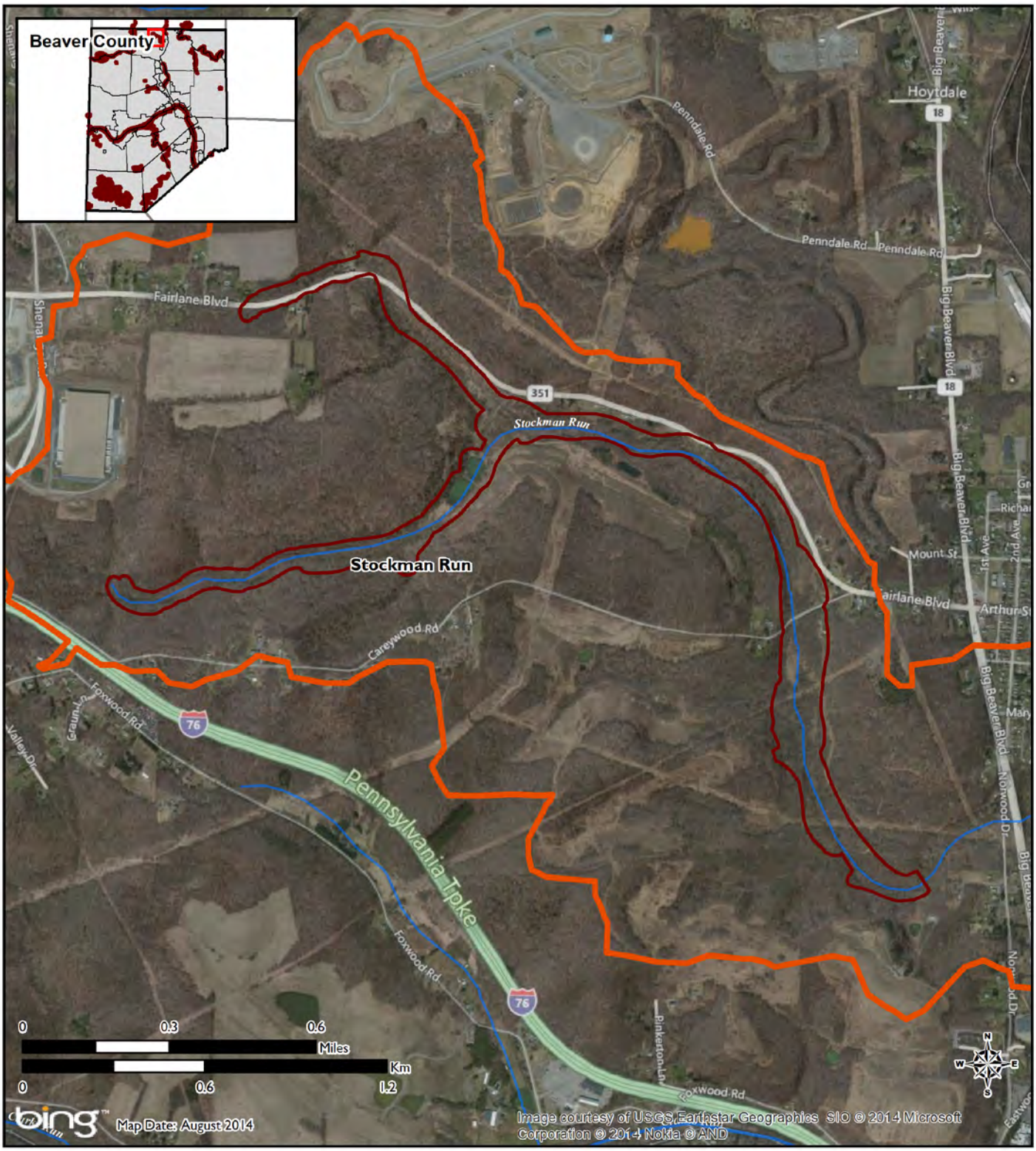
Conservation Recommendations

The following steps are recommended to ensure the persistence of the species at this site:

- Maintain and rebuild floodplains and forest buffers to stabilize ground composition and prevent excess sedimentation from washing into waterways.
- Alternative road de-icing agents such as calcium magnesium acetate are less environmentally harmful than chloride salts and should be used when possible. Managing runoff from roads will also limit harmful chemical effects.

Location

Municipalities: *Beaver County: Big Beaver Borough*
USGS quads: *Beaver Falls*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Stockman Run
Natural Heritage Area

Aquatic habitat at this site supports a population of a sensitive species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

- ***Core Habitat***
- ***Supporting Landscape***
- ***Other Core Habitat***
- ***Other Supporting Landscape***

Upper Brush Creek NHA

PNHP Significance Rank: *State*

Site Description

This site is centered on 12 acres of riparian forest along an oxbow of Brush Creek, between Glen Eden Road and the Pennsylvania Turnpike. The oxbow was created when the construction of the turnpike cut off a loop of Brush Creek. This riparian forest, along with adjacent lands and Brush Creek, support a **sensitive species of concern**.

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Sensitive species of concern A[3]	**S**	---	---	---	4/5/2013	E

[1]See the PNHP website (http://www.naturalheritage.state.pa.us/RankStatusDef.aspx) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.
[2]See NatureServe website (http://www.natureserve.org/explorer/eorankguide.htm) for an explanation of quality ranks.
[3]This species is not named by request of the jurisdictional agency responsible for its protection.

Threats and Stresses

Specific threats and stresses to the elements present at this site include the following:

- The sensitive species of concern is vulnerable to human disturbance. Significant additional human disturbance within 1000 feet (305 meters) could trigger permanent abandonment of the area. The species appears to be habituated to the current levels of turnpike traffic and other human activities, but any extreme events or increase in activity or noise could cause abandonment.
- The species of concern at this site rely on good water quality, and are vulnerable to siltation and chemical pollution.

Conservation Recommendations

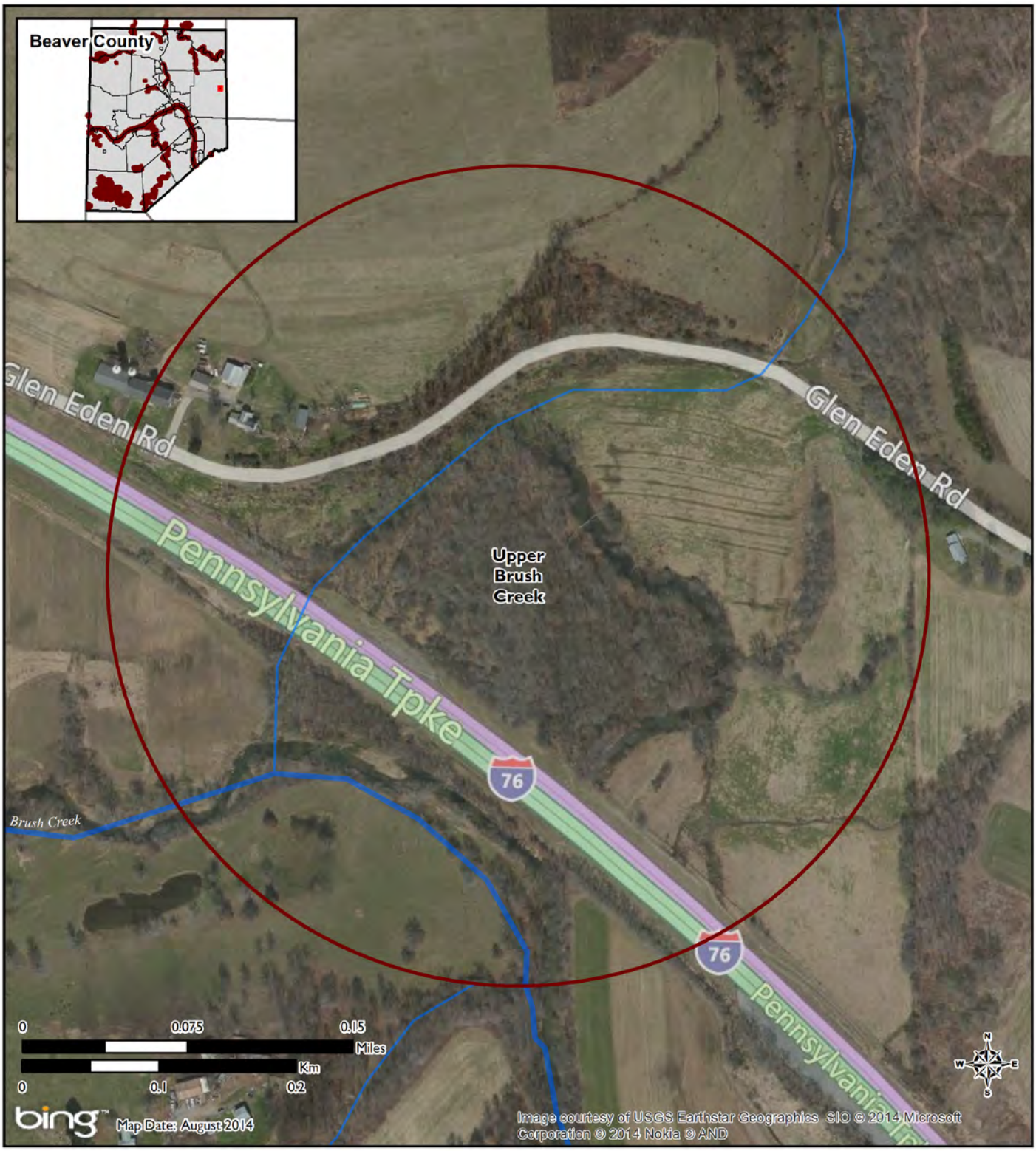
Additional development within the Core Habitat should be avoided to protect the sensitive species of concern. Disturbance within the Core Habitat should not be a problem for this species if it occurs during non-breeding season (September – February).

The following steps are recommended to ensure the persistence of these species at this site:

- Avoid or minimize human disturbance to the Core Habitat during the March through August breeding season.
- Maintain at least a 100 foot (30 meter) buffer of woody vegetation along streams to help reduce erosion, sedimentation, and pollution. Nearby streams through non-forested areas should be restored with native trees and shrubs appropriate to the habitat.
- Additionally, best management practices (BMPs) that limit the introduction of non-point sources of pollution into surface and groundwater should be applied to the surrounding area
- Avoid fragmenting the existing forested areas with additional buildings or infrastructure.

Location

Municipalities: *Beaver County: New Sewickley Township*
USGS quads: *Baden*
Previous CNHI reference: *Brush Creek Floodplain*
Associated NHAs: *None*
Overlapping Protected Lands: *Brush Creek Floodplain*



Upper Brush Creek Natural Heritage Area

Forest and aquatic habitats at this site support a sensitive species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas
- ***Core Habitat***
- **Supporting Landscape**
- ***Other Supporting Landscape***